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Skeptical Inquirer

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THE POLITICIZATION of Scientific Issues

Electrodermal Screening Fakery

Why Fallacies Aren't a Good Tool for Skeptics

Bigfoot's 7 Stages of Myth

How Early Can We Teach Critical Thinking?

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[FROM THE EDITOR

The Spectrum of Skepticism

The concerns of scientific skeptics cover an astonishingly wide range of issues, with an equal variety of emphases and approaches. The articles in this issue typify that.

Jeanne Goldberg's cover article, "The Politicization of Scientific Issues," is as timely as today's headlines, but she approaches the subject with deep philosophical and historical context. In her first essay for SI, she takes us back to Lucretius, who insightfully championed a naturalistic, scientific worldview; to Galileo's disgust at critics not looking through his telescope to see for themselves the wonders of the solar system; to our Enlightenment-era "citizen-scientist" Founding Fathers, who treasured both philosophy and science; to subsequent nineteenth-century trends of religiosity and anti-authoritarianism in America's westward expansion; to America's continuing strands of anti-intellectualism that Richard Hofstadter described more than half a century ago; to today's War on Science (not just a telling phrase but the title of Shawn Otto's voluminous and insightful 2016 book on the topic).

Stephen Barrett, MD, famed for his Quackwatch website, examines "The Fakery of Electrodermal Screening," one of many bogus devices and techniques alternative practitioners promote with little to no regard for scientific evidence or, apparently, ethical scruples. In "The Fallacy Fork: Why It's Time to Get Rid of Fallacy Theory," philosopher Maarten Boudry engages in some inward-looking self-criticism of one of the key tools skeptics use: pointing out the logical fallacies the credulous employ. Calling out such fallacies may *seem* useful to skeptics, but Boudry argues provocatively that they aren't what they're cracked up to be and they are counterproductive in skeptical analysis. Skeptics might at first disagree, but his argument demands reflection. And in "Bigfoot as Myth: Seven Phases of Mythmaking," our longtime senior research fellow, Joe Nickell, does another type of skeptical treatment: a broad synthesis of fifty years (since the famous "Bigsuit" photo) of the evolution of the Bigfoot myth, from its earliest origins through a series of transformations. But, he concludes, it all still adds up to one thing: imaginary creature.

Our regular columnists, as always, likewise cover broad territory, including Nickell's storied ghosts of Australia; James Randi's pungent put-down of polygraph tests; Massimo Polidoro's examination of the murderous Monster of Florence; Matthew Nisbet's thoughtful consideration of better ways to advance evolution teaching in college without turning off religious students; Stuart Vyse's look at the fascinating psychology professor Daryl Bem and one of the most serious statistical flaws of some past research papers in psychology and parapsychology; and Benjamin Radford's reply to a poor fellow who thinks he is seeing and videotaping plasma orbs.

As I have said before, scientific skeptics do it all, from investigating a host of what we might at first think are trivial claims (which if not countered can lead to much worse misinformation) to thoughtful examination of changing (and troubling) social, cultural, and political trends in attitudes toward science, thinking, and, indeed, knowledge itself.

—Kendrick Frazier

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Our Values: Integrity, Courage, Innovation, Empathy, Learning, and Wonder.

Understanding Gallup's Latest Poll on Evolution

Glenn Branch

When a pollster that's been surveying public opinion about evolution at intervals over the past thirty-five years declares, "In US, Belief in Creationist View of Humans at New Low," as Gallup did on May 22, 2017, it's a good idea to pay attention. But it's also a good idea to pay attention to the details.

Since 1982, Gallup has been asking "Which of the following statements comes closest to your views on the origin and development of human beings?" and presenting respondents with three options (not always in the same order, to control for order effects):

- God created human beings pretty much in their present form at one time within the last 10,000 years or so;
- Human beings developed over millions of years from less advanced forms of life, but God guided this process;
- Human beings have developed over millions of years from less advanced forms of life, but God had *no part* in this process. (emphasis in original)

For brevity and consistency with the terminology in Gallup's latest report, let's call the views expressed by these statements the "creationist view," the "guided evolution view," and the "secular view," respectively.

The Headlines

The big news, as advertised by Gallup's headline, is that the level of support for the creationist view is at a new low. Indeed, in 1982, 44 percent of respondents favored the creationist view. Never quite breaking the 50 percent mark, the level of support didn't dip below the 1982 level until 2017, when it reached only 38 percent.

As a result of the fall in support of the creationist view, the guided evolution view is now equally popular, with a 38 percent level of support. That was the same level of support it enjoyed in 1982, although it rose as high as 40 percent and sunk as low as 32 percent in the intervening years.

There are limits, of course, to what can be inferred from public opinion poll data in general.

The level of support of the secular view is now at 19 percent. That represents a substantial increase, for it began at 9 percent in 1982 and remained relatively flat from then until the turn of the century. But it more than doubled between 1999 and 2014, when it first reached the 19 percent level.

There are limits, of course, to what can be inferred from public opinion poll data in general. But there are features of Gallup's question in particular that make understanding the results

Which of the following statements comes closest to your views on the origin and development of human beings?

By education, religious preference and church attendance

	Humans evolved, God guided process	Humans evolved, God had no part in process	God created humans in present form within last 10,000 years
	%	%	%
Education			
High school or less	33	12	48
Some college	38	16	42
College graduate	45	27	24
Postgraduate	45	31	21
Religious preference			
Protestant/Other Christian	39	6	50
Catholic	45	11	37
None	29	57	9
Church attendance			
Weekly	28	1	65
Nearly weekly/Monthly	44	6	45
Less often	40	35	21

GALLUP, MAY 3-7, 2017

less than straightforward—one inherent in the options offered to respondents and one resulting from the options not offered.

Examining the Options

The creationist option in Gallup's question is designed to appeal to creationists in general, not only to young-Earth creationists of the Ken Ham variety. Certainly young-Earth creationists would agree that humans were created by God within the last 10,000 years or so—because of course they think that everything was.

While creationism may be at a new low as measured by Gallup's question, it is important to remember that it remains alive and well, inspiring constant attacks on the teaching of evolution in statehouses, courthouses, and classrooms across the country.

But while old-Earth creationists don't think that everything was created by God within the last 10,000 years or so, they generally agree that humans were created by God within the last 50,000 years or so. (Hugh Ross's Reasons to Believe ministry seems recently to have extended the outmost bound to 150,000 years ago.)

It seems likely that old-Earth creationists would tend to accept the creationist view—perhaps grudgingly—rather than endorse the common descent of humans and the rest of life. It is harder for creationists to reconcile common descent than the antiquity of the universe with their interpretation of the Bible.

The secular option in Gallup's question, in contrast, is probably not designed to appeal only to atheists and agnostics. But its wording—emphasizing, in a way that may appear dogmatic, God's playing no part in evolution—may deter respondents of faith from accepting it, even if they have no quarrel with any of the science.

As a result, the guided evolution option is likely to attract respondents who, on the one hand, accept common descent and, on the other hand, believe in God—a category so heterogeneous that it includes both Michael Behe and Kenneth R. Miller, who testified on opposite sides in the *Kitzmiller v. Dover* "intelligent design" trial in 2005.

Uncertainty and Ambivalence

It would be a mistake to think that Gallup's respondents are firmly committed to, and wholly sure of, their responses. Answers that don't match the three options and refusals to answer are recorded as "Other/No opinion" (5 percent in 2017), but they are not explicitly invited. That demonstrably makes a big difference.

In 2009, George F. Bishop and his colleagues conducted a survey using a modified version of the Gallup question, which added two more options to capture ambivalence and uncertainty:

- None of these come close to my beliefs;
- Not at all sure which is true.

They found that the new options attracted almost a quarter of respondents: 10 percent of respondents were ambivalent—not regarding any of the standard Gallup choices as appealing—and 14 percent were uncertain.

The presence of the two extra options reduced the level of support of the creationist view (35 percent, compared to 44 percent in the 2008 Gallup poll) and of the guided evolution view (26 percent, as compared to 36 percent), but not of the secular view (16 percent, as compared to 14 percent).

Applying a proportionate adjustment to the 2017 data from Gallup would result in 29 percent support of the creationist view, 27 percent support of the guided evolution view, and 21 percent support of the secular view. There would no longer be a majority explicitly accepting common descent, although at 48 percent it would be close.

The Take-Home Message

So it seems, on the one hand, that the conceptual geography of the creationism/evolution controversy is more complicated than Gallup's question acknowledges, and, on the other hand, that the public's engagement with the controversy is less intensive than Gallup's question presupposes.

This is not to criticize Gallup, which deserves credit, especially for its persistence in asking the same question for thirty-five years. But it is a reminder that poll results must be interpreted with care, to compare them with the results from different polls, and above all to look at trends rather than at individual polls.

While creationism may be at a new low as measured by Gallup's question, it is important to remember that it remains alive and well, inspiring constant attacks on the teaching of evolution in statehouses, courthouses, and classrooms across the country. There is certainly no cause for complacency.

Further Reading

Berkman, Michael, and Eric Plutzer. 2010. *Evolution, Creationism, and the Battle to Control America's Classrooms*. Cambridge: Cambridge University Press.

Bishop, George F., Randal K. Thomas, and Jason A. Wood. 2010. Measurement error, anomalies, and complexities in Americans' beliefs about human evolution. *Survey Practice* 3(1). Available online at http://surveypractice.org/index.php/SurveyPractice/article/view/119/html.

Gallup News Service. 2017. Gallup polls social series: Values and beliefs. Gallup. Available online at http://www.gallup.com/file/poll/210974/170522Evolution.pdf.

Swift, Art. 2017. In US, belief in creationist view of humans at new low. Gallup (May 22). Available online at http://www.gallup.com/poll/210956/belief-creationist-view-humans-new-low.aspx.

Glenn Branch is deputy director of the National Center for Science Education.

CFI, Richard Dawkins, Teachers Slam as 'Unconscionable' Turkey's Decision to Ban Teaching Evolution

Kendrick Frazier

Turkey already ranked even worse than the United States in its nonacceptance of evolution, but now Turkey's current right-wing government has gone even further and made it official: It will no longer allow the teaching of evolution in schools.

The Center for Inquiry (CFI) and famed evolutionary biologist Richard Dawkins both immediately decried the ban as "unconscionable." Turkey's teachers' union also blasted the move.

The Education Ministry of Turkey announced on June 21 that it will no longer allow the teaching of evolution in schools. It is backed by Turkish President Recep Erdogan, busy reversing the country's secularist foundations established in the 1920s by the founder of modern Turkey, Mustafa Ataturk. Ataturk had banned Islam from public life. The new government is pursuing a religious conservative agenda based on Islamist principles, and evolution is clearly one of its targets. A chapter titled "Beginning of Life and Evolution" will be deleted from the standard ninth-grade biology textbooks, and the material will be available only to university students.

"Turkey will be the second country after Saudi Arabia that excludes theory of evolution from its curriculum," said Feray Aytekin Aydogan, the head of Egitim-Sen, a teachers' union representing more than 100,000 members across the country of Turkey, according to a BBC report. "Even in Iran, there are 60 hours of lessons on evolution and 11 hours on Darwin himself," she added.

"Our teachers will be protesting out on the street and in the classrooms; they will carry on educating the students according to secular and scientific values no matter what the government does," she said.

CFI, which supports science, reason, and secularism, slammed the ban. "This is a tragedy for the future of Turkey, as a generation of its young people will be robbed of the opportunity to learn about this fundamental and undeniable principle of biology, and misled about their country's secular foundations," said Robyn Blumner, president and CEO of the Center for Inquiry in a statement issued June 23. CFI publishes the Skeptical Inquirer in association with the Committee for Skeptical Inquiry.

"As Turkish scientists will agree, evolution is an established fact, as firmly established as plate tectonic movements or the solar orbits of the planets," said biologist and CSI Fellow Richard Dawkins, whose foundation, as of last year, is a division of CFI. "I'd like to pay the Turkish framers of this ridiculous education policy the compliment of assuming that they are cynical political manipulators. But actually, I fear they are more likely to be just plain stupid."

Alpaslan Durmus, head of the Education Ministry's curriculum board, claimed that evolution was "too controversial" a subject for students, and that it is "beyond their comprehension." The new curriculum, which will also diminish the importance of secularism in the country's founding and history, is set to take effect in 2019.

"The claim that evolution is 'too complicated' is absurd and an insult to Turkey's students and teachers," said Blumner. "We know from our work with middle school science teachers that students pretty easily grasp the basic principles of evolution. Moreover, learning about natural selection—the process that undergirds the diversity of all of life on Earth—fascinates and inspires students. How can the government even consider withholding that from students?"

The Richard Dawkins Foundation for Reason & Science sponsors the Teacher Institute for Evolutionary Science (TIES), a program dedicated to training middle school science teachers to more effectively teach evolution and answer its critics.

"We urge the Turkish government to reverse course. Purposely fostering scientific ignorance will handicap generations of children," said Blumner. "The Turkish people must speak out against this decision, and stand up for their children's—and their country's—future."

Turkish President Recep Erdogan

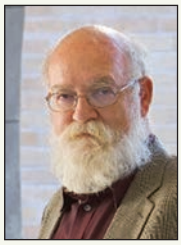
* * *

On the flip side of this issue, Britain has banned the teaching of creationism as a scientific theory. The U.K. government issued a document on June 9 stating that creationism "does not accord with the very large body of scientific evidence, nor does it accurately and consistently employ the scientific method, and as such it should not be presented to pupils at the Academy as a scientific theory." It also noted that creationism is rejected by "most mainstream churches and religious traditions. . . as well as by the scientific community."

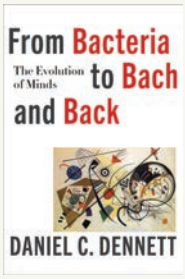
The document defined creationism as "any doctrine or theory which holds that natural biological processes cannot account for the history, diversity, and complexity of life on earth and therefore rejects the scientific theory of evolution." Scientists and educators welcomed this pro-science action.

Kendrick Frazier is the editor of the Skeptical Inquirer.

CSI Fellows in the News



Daniel C. Dennett, professor of philosophy at Tufts University and author of the new book *From Bacteria to Bach and Back*, was the subject of a lengthy profile in the March 27 *The New Yorker,* titled "Daniel Dennett's Science of the Soul: A Philosopher's Lifelong Quest to Understand the Making of the Mind." It is available online at http://www.newyorker.com/magazine/2017/03/27/daniel-dennetts-science-of-the-soul.



Paleontologist/geologist and prolific author **Daniel R. Prothero** received the National Center for Science Education's 2016 Friend of Darwin Award at a banquet March 30, 2017.

Thomas R. Casten, energy expert and founder of three cogeneration and energy-recycling companies, was honored at a celebration of his life on March 16 in Hinsdale, Illinois. Among awards he received was the Climate Institute's David Burwell Memorial Award for Environmental Innovation, presented by Institute President and CEO John C. Topping Jr.

Benjamin Radford's book *Bad Clowns* was a Book of the Year Award Finalist for the 2016 INDIES (Independent Publisher) awards and was awarded the Bronze Medal in the Popular Culture category. Ben is a CSI research fellow and the deputy editor of SI. See http://www.independentpublisher.com/article.php?page=2172 for details.

CSI Senior Research Fellow and SI columnist **Joe Nickell** has received the 2017 Distinguished Service Award of Science Exploration Day at the University at Buffalo. For more than two decades, he has been a mainstay among the presenters and supporters of the annual event.

POINT OF INQUIRY

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Psychic Roundup: 'Psychics' Convicted

Benjamin Radford

The first few months of 2017 have not been good for those who claim to have psychic powers. Between April and August 2015, a Hong Kong taxi driver tricked one of his girlfriend's daughters into having sex with him, telling her it would help keep evil spirits away from her younger sister. The man, who was not named to protect the identity of his victims, was convicted of several offenses and sentenced to fifteen years in prison. According to an April 10, 2017, article in the *South China Morning Post*, "the taxi driver told the then 17-year-old girl that her younger sister was 'ill fated' [cursed]. The victim—referred to as 'Y' in court to protect her identity—believed this and had sex with him as she was assured that such contact could ward off the evil spirits harassing her sibling." The girls said that the driver often referred to *gong tau*, a form of black magic originating in Southeast Asia, and that he claimed to be performing rituals related to astrological signs "to prevent harm" to the girls. "He said he was reincarnated. He said he used to be possessed by many evil spirits," the younger girl added. Psychological reports on the defendant ordered by the court stated that he was failing to cope with a midlife crisis and invented his mysterious experiences and psychic abilities to impress women.

It is unfortunately not uncommon for people pretending to have psychic powers to use the deception to sexually exploit others. In June 2012, British psychic and spiritualist Karl Lang was accused of tricking two women into stripping and performing sex acts in order to speak to their dead relatives. According to an article in the *Daily Telegraph*:

> A young woman told a jury today how a psychic tricked her into performing "like a porn star" in the hope of getting in touch with her dead grandfather. Medium Karl Lang is accused of persuading the woman, 26, to strip naked during a séance because it increased her powers to contact the spirit world. . . . The other victim, now 27, said: "The first time I stripped off my clothes he said 'Well done! You've gone up a level in the spiritual world.'. . . He told me the more outrageous I behaved, the higher level I would get."

Lang was convicted on twelve counts and sentenced to two years in prison.

In an ironic turn of events, a con woman posed as a famous psychic in order to exploit and fleece her followers. A British woman named Gemma Badley sought clients through a fake Facebook profile using prominent psychic Sally Morgan's name and photo. Badley admitted to five counts of fraud by false representation but asked the court for leniency, citing her alcoholism and gambling addiction as mitigating circumstances. She was sentenced in February 2017 to six months in prison and ordered to pay about $1,000 in restitution to her victims. In an interview, Morgan complained about being exploited by the fake psychic: "It has been horrendous. What she did to me, I would say, is as bad as stalking. . . . She basically pretended to be me, and it was frightening as I've never even met her."

In an ironic turn of events, a con woman posed as a famous psychic in order to exploit and fleece her followers.

Becky Ann Lee, a Colorado psychic, was arrested last year for scamming a woman out of nearly a quarter million dollars. The victim, Victoria Lacoste—a member of the family that founded the Lacoste clothing company—began seeing Lee in 2014 for psychic services, including tarot card readings and chakra balancing at her business, Psychic Chakra Spa in Boulder. Lee told Lacoste that the money given to her would be used to buy gold coins, which would in turn be used by Lee in rituals to help Lacoste avoid "evil spirits." Instead, Lee pawned the gold coins and was evasive when Lacoste asked where they were. Lee was given probation and ordered to repay the $232,667 she admitted to stealing from her victim.

It is not unusual for psychics to receive light sentences. This is in part because bunco artists are not seen as a priority, either by police or prosecutors (see "'Psychic Swindler' in San Antonio Convicted of Theft by Coercion," SI November/December 2005, and "'Psychic' Evans Acquitted on Appeal in Swindling Case," SI May/June 2007). Violent crimes, including rape, murder, and robberies, will always have higher priority than property crimes or fraud, for example. In many cases, the public (and even prosecutors) may feel that anyone gullible enough to be scammed by centuries-old Gypsy curse scams and outlandish claims deserves to be ripped off.

Many victims are reluctant to report out of embarrassment, not wanting friends and family to know they handed over their life's savings to someone who claimed to perform magic. But those who consult psychics are often emotionally and psychologically vulnerable people who may be dealing with grief or suffering through personal crises; they no more "deserve" to be conned than do cancer victims who seek out alternative medicines or treatments—or anyone else.

Benjamin Radford is the deputy editor of Skeptical Inquirer and author of ten books.

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Genetic Engineering through Music?

Douglas M. Stokes

The *Journal of Scientific Exploration* (JSE) is one of the major academic journals in parapsychology and the study of other "alternative facts" (to borrow a phrase from one of President Trump's key advisors, Kellyanne Conway).

The Spring 2017 issue of JSE carries an article by Jeff Levin of Baylor University titled "New Paradigm Research in Medicine: An Agenda." Among the many topics Levin discusses in his paper is the subject of "The Use of Sound and Music in Genetic Engineering."

Levin draws heavily upon the work of the late Dr. Sushumu Ohno, a microbiologist. Ohno assigned musical notes to each of the basic nucleic acids, the building blocks of genes. The notes were written out in the sequence in which they appeared in a particular gene. (Oh no, Ohno! I don't like where this is headed!) In this way, musical scores encoded from the genes of mice, rainbow trout, slime molds, a chicken's eye, "and so on" were obtained. Levin states that when these scores were played, there was a "remarkable resemblance of the resultant music to the intrinsic essence or the soul of the seed DNA sequence." For instance, the score for a mouse sounded like an uptempo waltz; the score for the lens of the eye sounded light and airy; and the score for an oncogene (cancer-causing gene) sounded somber. Levin states that: "In reverse, the same correspondence held; for example, a funeral march by Chopin, when decoded, resembled a human cancer gene."

The medical implications are of course staggering. For instance, Levin states:

> Does the patient have an infection? Then take a sound bite of the appropriate antibiotic. No cost, no toxic side effects, no pharmaceutical profits. On the downside, want to harm a large population—an incurable disease or agricultural blight perhaps? Then how about a form of mutagenic terrorism—the introduction of a genera of music into a culture or society which can precipitate disease through wreaking genetic mutations? [Kenny G. perhaps?]

Not content to limit his perspective to therapeutic music, Levin expands his scope to include alien abductions.

Levin insists that "these sorts of scenarios may not be so far-fetched." He cites work indicating that "specific tones have been identified to replace dental anesthesia, realign vertebrae, stimulate acupuncture meridians, and even provide a sort of massage."

Not content to limit his perspective to therapeutic music, Levin expands his scope to include alien abductions, hierophanies, thought forms, radionics, "arcane medical wisdom," and prenatal ensoulment.

The only reference Levin cites for Ohno's original work is an Associated Press article in the January 29, 1988, issue of the *Ann Arbor News*, my own hometown newspaper, way back when there used to be newspapers. Go Wolverines! Or should I say, Please stop, Wolverines! At once.

Douglas M. Stokes holds a PhD in experimental psychology from the University of Michigan and is a frequent contributor to the literature on parapsychology. His latest book is *Reimagining the Soul,* published by McFarland.

[INVESTIGATIVE FILES JOE NICKELL

Joe Nickell, PhD, is now well into his fifth decade as an investigative writer. He has investigated numerous hauntings in his books that include *The Science of Ghosts* (2012).

Australia's Storied Ghosts

Whenever someone relates his or her ghost encounter, a story is born. And, as folklorists know well, stories tend to evolve in the retelling—changing and becoming embellished by others over time. Thus are created *variants*, evidence of the folklore process at work. When a writer creates an imitation tale, the product is called "fakelore," but, ironically, even this can become subject to the oral tradition that produces variants, and that can provide an entirely made-up tale with the appearance of having a basis in truth.

What follows are three of Australia's most, well, *storied* ghosts, those linked to history or legend. But beyond their themes of murder, strange encounter, and lost treasure, are they something more than literary tales? Let us see if investigation can help winnow the evidential wheat from the imaginative chaff.

Case of the Gesturing Specter

Australia's most celebrated ghost is, hands down, the alleged specter of Frederick Fisher, attracting such notables as Charles Dickens (who published one version of the story in his journal *Household Words* ["Fisher's Ghost" 1853]) and magician John Pepper (who made it the subject of his sensational "Pepper's ghost" stage illusion in a circa 1879 performance in Sydney ["Illusionist" 1984]). The tale has been related in poems and songs, plays and operas, books, countless newspaper articles, and other venues, as well as being the inspiration for a movie and the focus of an annual festival in Campbelltown—all this, even though the ghost reportedly appeared "to just one man on one occasion" long ago (Davis 1998, 16).

In 2000 on my first tour Down Under, I investigated the case on-site (Nickell 2004, 304–310), generously assisted by magic historian Peter Rodgers (with whom I shared other detective adventures [Nickell 2004, 289–295, 331–334]). We naturally began with a trip to Campbelltown, where the historical events transpired.

The story behind the ghost story began with the disappearance of Frederick Fisher on June 17, 1826. A "ticket-of-leave man" (a parolee), Fisher had built a shack in the town, where he caroused with his fellow paroled convicts and assorted petty criminals. To protect his assets while he was incarcerated, he had signed over everything to his neighbor, George Worrell (or Worrall). Unfortunately, on his release

Figure 1. An artist's impression of the appearance of Fisher's ghost in 1826. (From an old wood engraving)

Fisher discovered that Worrell had claimed his property, at which time Fisher conveniently disappeared.

Worrell told inquirers that his friend had returned to England, but suspicions were raised when Worrell was seen wearing Fred Fisher's clothing, and again when he "proved" he owned one of Fisher's missing horses by exhibiting an amateurishly forged sales receipt. The Colonial Secretary's Office offered a reward for the "discovery of the body of the missing man" or a lesser amount for proof that he had genuinely "quitted the Colony."

At this point, a townsman by the name of James Farley (or John Hurley) reportedly came upon Fisher's ghost! While walking near the Fisher property one night, he saw, it was said, the man's eerily glowing apparition, sitting on a fence and bleeding from a gash to the head (see Figure 1). Moaning, the specter "pointed a bony finger in the direction of the creek . . . behind Fisher's farm." The sighting supposedly prompted police to search the area, and soon the late parolee's corpse was unearthed. Worrell was subsequently arrested, convicted, and—having belatedly confessed—hanged (Fowler 1991, 13).

The gesture of the apparition would suggest that it acted like many another purposeful phantom of old that sometimes "advised where their bodies might be discovered" (Finucane 1984, 194). But did that really happen? I was able to examine the historical records of the proceedings of the Supreme Criminal Court of February 2, 1827, and confirmed that they make absolutely no mention of a ghost. In fact, positive evidence in the proceedings demonstrated that Fisher's body was found in a natural instead of supernatural manner. A constable discovered blood on fence rails at Fisher's paddock and he searched the area, aided by two Aboriginal trackers. They found a surface disturbance at a marshy spot, probed with an iron rod, then used a spade to excavate further. Presently, they uncovered "the left hand of a man lying on his side" but stopped to await further excavation by the coroner. Subsequent examination revealed "several fractures were found in the head" (Supreme Criminal Court 1827).

It appears that the story of the gesturing ghost did not obtain from an apparitional experience. It was likely launched by an anonymous poem, a *fictionalized* narrative published in 1832 titled "The Spirit of the Creek," bearing a prefatory note that it was based on the murder of "poor F*****" at Campbelltown. Over time the tale shows evidence of folkloric evolution. For example, the earliest version has Fisher sitting on the rail of a fence, but that motif was in time transferred to the rail of a bridge, and, when that was rebuilt at a different site, the supposed apparition again followed—proof that a fictional ghost can live on as well as any.

Positive evidence in the proceedings demonstrated that Fisher's body was found in a natural instead of supernatural manner.

The Ghost of Black Mountain

In Robert Willson's *Canberra Cavalcade: Tales of the People and Legends of Southern New South Wales* (1996, 109–111) is an account of a spine-tingling Australian ghost tale of 1927. Or perhaps, as I came to suspect, it is something else entirely.

The story begins with a journalist for *The Argus* having climbed to the top of Black Mountain to view the scene below: Australia's capital city, Canberra. The journalist was Donald Macdonald (1859–1932) who had worked for the paper for half a century, including having been its Boer War correspondent. Now he was looking down upon the bustle and clamor resulting from preparations for Parliament to be opened by the Duke of York. As I read the tale, I realized I needed to see Macdonald's full original text rather than a summary with selected quotes.

In his own account, Macdonald (1927) tells how he was sitting on the trunk of a fallen tree when he chanced to look around. He was startled to see a man seated at the log's opposite end "as if he had been there all day." Dressed in the long-outdated attire of an old

Figure 2. A view from Black Mountain. (Photo by Joe Nickell)

stockman, the stranger responded to Macdonald's greeting by asking if he could spare some tobacco, whereupon the journalist tossed him his pouch of Navy Cut. The stranger replied, "Well, I always smoke Barrett's twist meself," adding, "But any sort does me." Macdonald wondered how the old fellow gets such a bygone brand.

The two sat and talked casually. Puffing on his pipe, the stranger asked about the hubbub below. He had thought perhaps some tavernkeeper was getting up public-house races for Easter, and he reminisced about them, recalling how a gang of bushrangers once stole a winning horse from its stable. He seemed rather out of touch with the present but reckoned, "I been about this mountain on and off for the last forty years." Macdonald thought to himself, "Again that echo of a distant past, of years dead and gone." He filled the man in on current events, but at mention of the Prime *Minister*, the stockman thought he meant a preacher, and he rambled on, giving a garbled account of "that Bible yarn about Moses leadin' the Philistines out of the Land of Plenty into the desert of Moab."

Eventually the journalist interrupted to ask, apologetically, ". . . would you mind telling me who you are and what you do up here?"

"'I do nothin' but walk now and agin,' said the old stockman. 'I died up here forty-seven years ago and they buried me under that gum-tree over there. You've maybe heard of me. I'm the ghost of Black Mountain.'"

At this, Macdonald tells us: "I bade him good night and went briskly down the mountain. Having sat so long at that elevation I felt a slight chill. So I hurried."

Now, this tale may be a bit chilling too, but a little reflecting demonstrates that its intent is not to report, literally, a ghost encounter. After all, the specter looks like an actual person and it interacts with Macdonald for an extended period of time—unlike most reported apparitional experiences, which are fleeting. (Apparitions are a trick of mind by which imagery welling up from the subconscious is superimposed on the visual scene [Nickell 2012, 345].)

A longer experience might occur in a daydream, but in this case something else is going on. Consider for instance the act of a ghost smoking *actual tobacco* that was provided for its *ghost pipe*—surely a storybook element. As related in "On Black Mountain," it is clear that Macdonald's reverie is really a literary device.

The stockman's ghost is simply metaphoric. This is not surprising since writer Edward S. Cunningham (1933) called Macdonald "the poet of the forest, the stream, the highways and byways, mountains and valleys, and of all wild creatures of feather and fur and fin." Not only is the subtitle of Macdonald's book "Nature and Reflective Essays," but early on (in the second paragraph) poet Macdonald drops a hint as to what he is doing (Macdonald 1933). Revealingly, he says that the stranger in old garb was "a bit of Canberra's primitive past strayed into the activities of her present to speculate, perhaps, as I did, upon all the wonderful possibilities of her future."

Looked at quite simply, he conjures up a ghost of the past (rather like Dickens does in *A Christmas Carol* [1843]) and imagines himself in a conversation with the "old stockman." The result is a review of what has gone before, complete with "bushrangers" (as roaming outlaws in the back country were called), as well as a contemporary (1927) look at the capital city and imaginings of what the future may hold. The solitude of Black Mountain's crest, as well as its vantage point (which I too have appreciated, Figure 2), made it an ideal setting—not for a ghost tale but a poetic, nostalgic vision of changing times.

Figure 3. Yarralumla (now the residence of Australia's Governor General) continues to be the focus of a ghost story. (Photo by Joe Nickell)

Haunting at Yarralumla

The most famous ghost in Canberra—the federal capital city—is that of a "blackfellow" (Australian for Aboriginal man)—who is central to a story about intrigue, murder, and buried treasure (Davis 1998, 160–163).

The treasure story is told in an old document found at Yarralumla—then the estate of Frederick Campbell (and now the residence of Australia's Governor General—see Figure 3). A visitor was being shown a stone vault on the grounds that held the remains of an earlier owner, when he came upon the old paper, covered in dust and cobwebs. He promptly delivered it to his host. Handwritten and unsigned, it read:

> In 1826 a large diamond was stolen from James Cobbity, on an obscure station in Queensland. The theft was traced to one of the convicts who had run away, probably to New South Wales. The convict was captured in 1858, but the diamond could not be traced, neither would the convict (name unknown) give any information, in spite of frequent floggings.
>
> During 1842 he left a statement to a groom, and a map of the hiding place of the hidden diamond.
>
> The groom, for a minor offence, was sent to Berrima Gaol. He was clever with horses and one day, when left to his duties, cleverly plaited a rope of straw and then escaped by throwing it over the wall, where it caught an iron bar. Passing it over, he swung himself down and escaped. He and his family lived out west for several years, according to Rev. James Hassall who, seeing him living honestly, did not think it necessary to inform against him. I have no reason to think he tried to sell the diamond. Probably the ownership of a thing so valuable would bring suspicion and lead to his re-arrest.
>
> After his death his son took possession of the jewel and, with a trusty blackfellow, set off for Sydney. After leaving Cooma for Queanbeyan they met with, it was after ascertained, a bushranging gang. The blackfellow and his companion were separated, and finally the former was captured and searched, to no avail, for he had swallowed the jewel.

The document continued:

> The gang in anger shot him. He was buried in a piece of land belonging to Colonel Gibbes, and later Mr Campbell. I believe the diamond to be among his bones. It is of great value. My hand is enfeebled with age, or I should describe the trouble through which I have passed. My life has been wasted, my money expended, I die almost destitute, and in sight of my goal.
>
> I believe the grave to be under the large deodar tree. Buried by blacks, it would be in a round hole.
>
> Believe and receive a fortune. Scoff and leave the jewel in its hiding place.
>
> Written near Yarralumla, 1881. ("Yarralumla's Tale" 1944)

In time, as this story was told and retold, there came to be an addition: a tale of the ghost "said to" visit the old homestead. In one version published in 1939, the fictitious ghost, styled "the black shadow of Yarralumla," was reportedly seen in summer "digging under an elm tree [*sic*] where a diamond of great value is said to be hidden and for which he is ever searching" (Sheridan 1939).

Source after source has repeated the tale as if treasure still lies under the deodar tree (a tall cedar)—albeit long out of reach to treasure seekers on the secure property where the Governor General now resides ("Yarralumla's Tale" 1944; "Under" 1945; Willson 1996, 110; "Is Canberra" 2015)! Nevertheless, not only was the document suspiciously unsigned, but the narrative has a decidedly storybook quality as well as a lack of logic: instead of confiding in someone who might assist him (and so provide a share of the treasure to benefit him in his old age), the anonymous author entrusts the secret to a document that he hides in an old tomb. The text sounds like it was made up by an adolescent—including its ending game-like dare to believe or not.

In fact, we now know it *was* an adolescent fiction. In 1945, Frederick Campbell's daughter Kate (then Mrs. Kate Newman) came forward in a letter to the *Sydney Morning Herald* to admit that the document that had since given rise to the ghost tale had been fabricated long ago by two schoolgirls: she and a friend staying at Yarralumla during holidays. Young Kate had obtained from her father's study a sheet of imitation-parchment notepaper on which she wrote the made-up story, then "aged" the document with dust and cobwebs. The two young scholars placed the paper in the vault before taking the unsuspecting visitor there so he could discover it!

And now, yet another storied ghost has been laid to rest. ■

Acknowledgments

I am indebted to John and Mary Frantz whose financial support has made many of my investigations around the world possible. I am also grateful to Australian skeptics Peter Rodgers, Kevin Davies, and Nick Ware for their generous on-site assistance and Tim Binga for his help as CFI Libraries Director.

References

Cunningham, Edward S. 1933. Foreword to Macdonald 1933, v–vii.

Davis, Richard. 1998. *The Ghost Guide to Australia*. Sydney: Bantam Books.

Finucane, R.C. 1984. *Appearances of the Dead: A Cultural History of Ghosts*. Amherst, NY: Prometheus Books.

Fisher's ghost. 1853. *Household Words* 7: 6–9.

Fowler, Verlie. 1991. *Colonial Days in Campbelltown: The Legend of Fisher's Ghost*, rev. ed. Campbelltown, NSW, Australia: Campbelltown & Airds Historical Society.

Illusionist brought Fisher's ghost to Pitt St. playhouse. 1984. *Daily Mirror* (March 22) [clipping in Campbelltown City Library's vertical file].

Is Canberra also Australia's ghost capital? 2015. Available online at http://weirdaustralia.com/2011/12/01/an-esoteric-guide-to-australias-capital/; accessed December 9, 2015.

Macdonald, Donald. 1927. On Black Mountain. A Canberra critic. *The Argus* (Melbourne, Victoria) (April 16); reprinted in Macdonald 1933, 28–33.

———. 1933. *The Brooks of Morning: Nature and Reflective Essays*, selected by his daughter. Sydney, Australia: Angus & Robertson Limited.

Nickell, Joe. 2004. *The Mystery Chronicles*. Lexington: The University Press of Kentucky.

———. 2012. *The Science of Ghosts: Searching for Spirits of the Dead*. Amherst, NY: Prometheus Books.

Reid, David. 2011. Yarralumla's Tale of Buried Treasure. Available online at https://www.davesact.com/2011/02/yarralumlas-tale-of-buried-treasure.html; accessed December 9, 2015.

Sheridan, Michael. 1939. Duchess will find friendly ghost at Yarralumla. *The Australian Women's Weekly* (August 12).

Supreme Criminal Court. 1827. Proceedings published in *Gazette* (Sydney) (February 5).

Under the deodar. 1945. *The Argus* (January 20). Available online at http://www.davesact.com/2011/04/yarralumlas-blackfellow-ghost.html; accessed December 9, 2015.

Willson, Robert. 1996. *Canberra Cavalcade: Tales of the People and Legends of Southern New South Wales*. Canberra, Australia: Mulini Press, 110.

Yarralumla's tale of buried treasure. 1944. *The Advertiser* (October 7). Clipping reproduced in Reid 2011.

[A MAGICIAN IN THE LAB JAMES RANDI

James Randi began his career as a stage magician and escape artist but achieved fame as a professional skeptic, disproving the claims of self-described psychics, mind readers, and faith healers. He is a founder of the Committee for Skeptical Inquiry (formerly CSICOP). Randi's eleventh book, *A Magician in the Laboratory*, will be coming out soon.

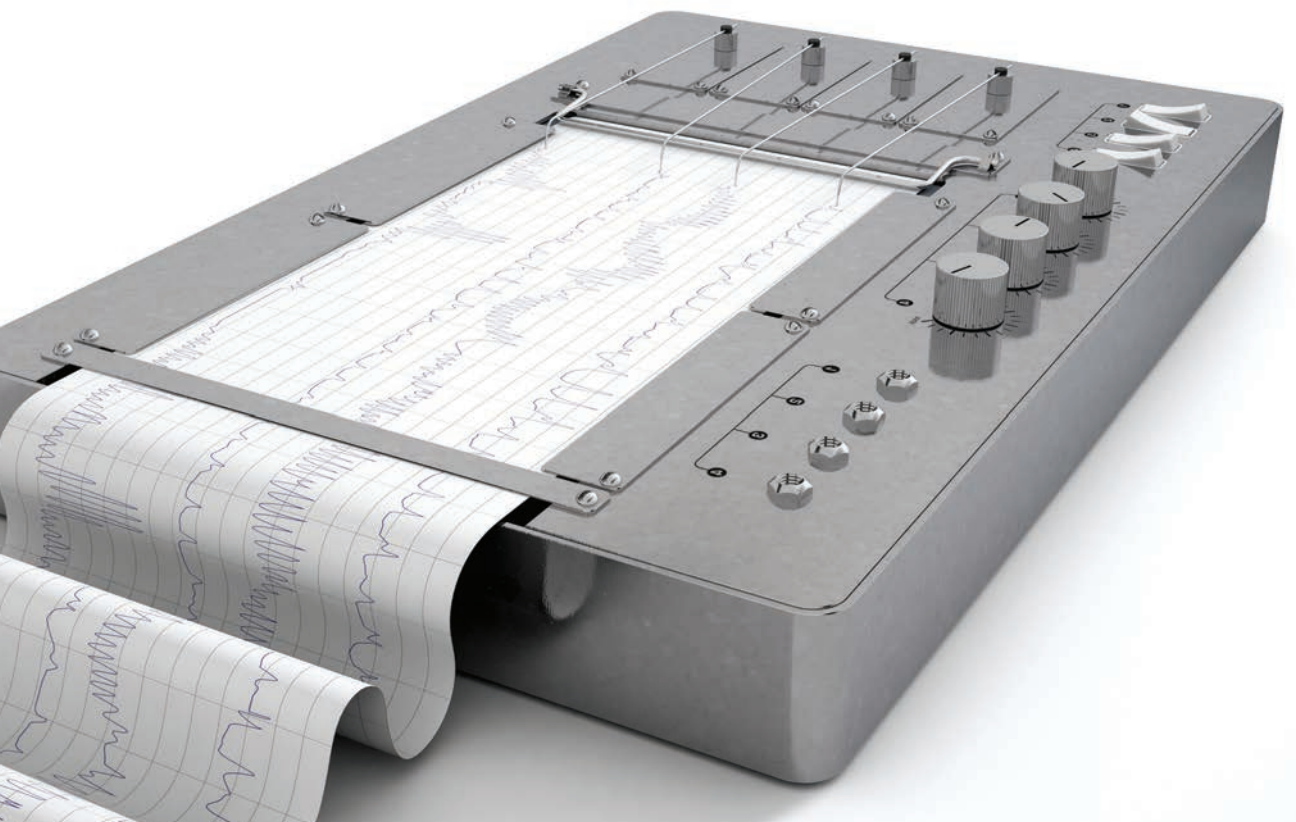
A Consistently Erroneous Technology

I've often been asked to participate as an advisor in court cases or investigations where I might be useful due to my experience as a conjuror, but I have always refused when required to accept evidence obtained via the polygraph, or lie detector as it's commonly known. However, if I were to be called upon to deny that this silly device is effective or dependable, I'd have no hesitation in doing so. The evidence is just so much against this technology, it's difficult to believe how long it has existed as a supposedly valid notion.

Look at the history of so-called "lie detection." The device itself is a nightmare of tubes, wires, electrodes, and moving styluses, something right out of a Bugs Bunny production. By measuring and displaying changes in the subject's respiration, heart rate, blood pressure, skin conductivity, and other variables of the human body, a complex series of graph lines is generated, and a technician is—theoretically—able to decide whether the answers to a set of questions were honestly given or not. We need not get into more involved aspects of the procedure such as who comes up with the questions to be asked—though that is a matter of primary importance, of course. Let's examine opinions of the "professionals" who should know.

On November 5, 2002, on his Pentagon letterhead as Assistant Secretary of Defense for Command, Control, Communications, and Intelligence, this memorandum was sent by John P. Stenbit to the directors and administrators of all major military offices of the Department of Defense:

> SUBJECT: Continued Use of Polygraph Techniques



> I have recently reviewed the report of the National Research Council on the existing scientific evidence on the validity of the polygraph technique. While the report contained many findings that may ultimately lead to improved methods for the detection of deception, I think it is important to emphasize that the National Research Council found that none of the potential new technologies for the detection of deception showed any promise of supplanting the polygraph technique for screening purposes in the near term.

I believe this could have included Tarot cards and Ouija boards as well and made just as much sense. Note that it doesn't say that the polygraph works at all! The truth is that it's a useless high-tech assemblage that has consistently failed double-blind tests of its efficacy, but the way the above paragraph was composed, there is a strong suggestion that the flummery actually has performed as claimed. This next paragraph is even worse, repeating the same inane claim and further implying that the polygraph really works:

> As the Department continues to research alternative technologies in this critical area, I believe it is important to remember that the National Research Council Report determined that the polygraph technique is the best tool currently available to detect deception.

"The best tool"? No, I'd vote for a pair of dice. Next, all in one paragraph, Secretary Stenbit referred to the polygraph as "an important tool"—twice!—when it is virtually useless, according to that same report by the National Academy of Sciences/National Research Council (as we shall see). This is simply a blatant denial of fact to bolster an erroneous—though official—opinion:

> In the coming months, our country will face many unique challenges to our national security. The polygraph technique remains an important tool to detect deception in selected national security and law enforcement matters. Where appropriate and authorized, I recommend that we continue to use the polygraph technique as an important tool in our total decision-making process.
>
> [signed] John P. Stenbit

Late in 2002, as if in reaction to Stenbit's comments, the U.S. National Research Council, a branch of the National Academy of Sciences, issued their official report on the use of the polygraph. Secretary Stenbit completely ignored this report's key finding that the use of the device was unjustified—and thus even dangerous to national security, nor did the report characterize polygraphy as "the best tool currently available to detect deception," as Stenbit had written. In their summary, the Council actually concluded: "Overall, the evidence [for polygraph validity] is scanty and scientifically weak… and some potential alternatives to the polygraph show promise, but none has yet been shown to outperform it."

The history of this farce is long and involved, with uninformed "experts" raving about success and law enforcement agencies smugly accepting results as if they were valid.

Since the polygraph works about as well as the Oracle at Delphi—another shaky premise, though much older—this is not at all supportive. Regarding polygraphy technology in general, the NAS/NRC stated that "…there is essentially no evidence on the incremental validity of polygraph testing, that is, its ability to add predictive value to that which can be achieved by other methods."

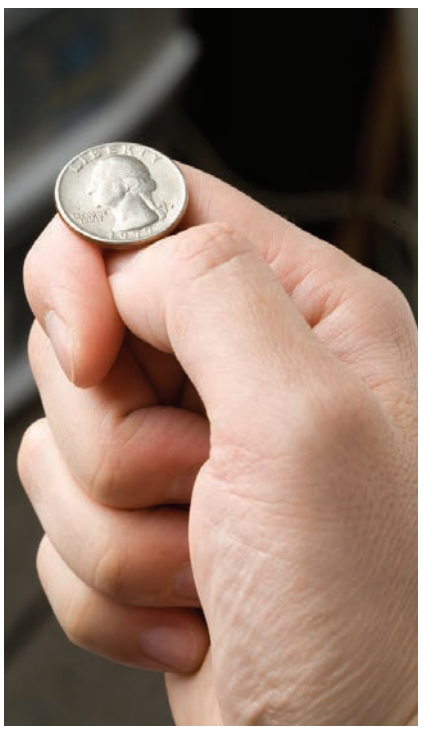
Let's examine the realities, folks. A CBS News account of a suicide bombing at a CIA base in Afghanistan stated, regarding the careless acceptance of a spy on the base: "The double agent was brought onto the base without first being given a polygraph test, one of the basic tools in establishing a spy's trustworthiness." This is nonsense; the polygraph simply does not work.

The history of this farce is long and involved, with uninformed "experts" raving about success and law enforcement agencies smugly accepting results as if they were valid. In addition to the Afghanistan case above, some very strong examples of this error stand out: In 1985, use of the polygraph did not expose the fact that Larry Wu-Tai Chin, a Chinese language translator working for the CIA in a critical capacity, was selling crucial information to China and had done so *for thirty-three years*, despite having been regularly subjected during that time to polygraph tests. In 1994, Aldrich Ames, a high-ranking CIA analyst, routinely passed all his polygraph exams, though for years he was a master

Aldrich Ames

Soviet spy who passed information on to his real employers. (Aldrich Ames even confirmed this directly to the Skeptical Inquirer. After Sandia National Laboratories Senior Scientist Alan P. Zelicoff published a denunciation of polygraph testing in SI in 2001, Ames wrote to SI from prison agreeing with the article and calling polygraphs "junk science" and "a superstition." SI published his letter [vol. 25, No. 6, 2001]; see also Morton Tavel, MD's, January/February 2016 SI cover article "The Lie Detector Test Revisited.") In

The media, too, are delighted with this electronic Bozo, which adds flashing lights, buzzing noises, and mystery to so many of their stories.



2001, Robert Hanssen of the FBI went similarly undetected despite the regular periodic "screening" of FBI employees using polygraphs. His treachery was described by a review of FBI Security Programs as "possibly the worst intelligence disaster in U.S. history."

The fact is that not a single spy has ever been caught by a polygraph screening exam. In 2003, the National Academy of Sciences issued its final report titled *The Polygraph and Lie Detection* that found the majority of polygraph research to be, in their words, "unreliable, unscientific, and biased" and that in national security matters and for law enforcement use, the level of accuracy drops to such a level that "its accuracy in distinguishing actual or potential security violators from innocent test takers is insufficient to justify reliance on its use in employee security screening in federal agencies."

The NAS also found the high rate of false positives obtained with the device to be unacceptable. Physicist and CSI Fellow Bob Parks, with his usual degree of wry humor, reported on this situation: "I have argued, however, that the small number of true positives is the real problem. I propose replacing the polygraph with a coin toss. That would identify 50 percent of the double agents compared to zero with the polygraph. The unfortunate increase in false positives constitutes collateral damage, which is inevitable in war."

The media, too, are delighted with this electronic Bozo, which adds flashing lights, buzzing noises, and mystery to so many of their stories. In the beginning of 2010, a prospective adoptive-couple—named by the FBI as "persons of interest" in the disappearance of an eight-month-old baby in Arizona—appealed on television to be administered a polygraph test to determine whether they were telling the truth. The test was duly administered, and the following day the polygraph examiners announced the result: inconclusive. Still, the general public perception is that the polygraph is a scientific device that works. The media rarely if ever mention the strong, well-founded scientific objections to the validity of the thing. In fact, as wag Bob Park—again—comments: "The polygraph looks for spikes in blood pressure, heart rate, respiration and perspiration. In other words, you can't tell a lie from the sex act."

Said Stephen E. Fienberg, chairman of the statistics department at Carnegie-Mellon University in Pittsburgh, who led the panel appointed by the National Academy of Sciences to evaluate the worth of polygraphy: "It's everywhere—every three- and four-letter agency you can imagine, including the US Postal Service."

That panel's report concluded that almost a century of research may have produced a pseudoscience good for tricking naive people into blurting out the truth, but not much else. Thus, Chairman Fienberg was rather surprised to find his panel's report cited *in favor* of potentially raising the number of lie detector tests the Department of Defense (DOD) is allowed to administer annually.

In a report it filed with Congress in January, the DOD stated it had administered more than 11,500 of these tests in fiscal year 2002. That's more than twenty a working day! Of that total, 4,219 were "counterintelligence-scope polygraph," or CSP, exams, subject to a 5,000-exams-per-year limit under 1991 Public Law 100-180. In its own report, the DOD put Congress on notice that it might ask for authorization to conduct more than that number, and cited the NAS report in support, according to Steven Aftergood, who monitors polygraph policy for the Federation of American Scientists. That DOD report stated: "It is important to note that the NRC [National Research Council] Report also concluded that the polygraph technique is the best tool currently available to detect deception and assess credibility.... The Department will continue to use the polygraph technique as it has in the past, until improved technologies or methodologies are developed as a result of scientific research."

Folks, *anything* would be an "improved technology" over this high-tech toy, the "best tool currently available"! Fortune cookies outperform it! Chairman Fienberg charitably called the DOD's reference to the NAS report

"disingenuous." A DOD spokesman said it was drawn directly from the NAS panel's conclusion that, while more promising technologies are on the horizon, none yet has supplanted polygraphy. He could have added that the Tooth Fairy has also not yet supplanted other means of providing funds to children. When asked, Don White, a spokesman for the Office of Inspector General (OIG) at the Department of Health and Human Services, would not discuss whether lie detector tests were part of their investigative procedure, but the DOD spokesman did name OIG as one of the government bodies that uses polygraphs.

To close this denunciation of this particular pseudoscience, I will first note that in the March/April 2013 Skeptical Inquirer, Dr. L.G. Wade Jr. commented on an article about phrenology, the "art" of reading bumps on the human head to determine character and talents. This was once actually used by employers, the military, and even in court proceedings to examine individuals, particularly in France, and was considered a real science, much as polygraphy still is today. Dr. Wade wrote:

> I was first alerted to the fraud of the "lie-detector" by two cases: A county assistant treasurer who was falsely accused of embezzlement, and a distraught widower who was falsely accused of murdering his wife. Both of these accused "failed" a polygraph exam (whatever that means) and were immediately convicted in the newspapers, with their reputations destroyed. They were both subsequently exonerated. The polygraph measures indicators of stress, and honest people who are falsely accused of heinous crimes are likely to "fail" the exam. On the other hand, hardened criminals show little stress when they are asked about their crimes.

Unlike phrenology, polygraph tests are still used and accepted by law-enforcement and the government. They are still used and absolutely required for a wide range of employment with the FBI, CIA, and police agencies.

What should you do if required to take a polygraph test? If you agree to take one, you may be placing your reputation in the hands of an unwitting charlatan who can proclaim you to be guilty or innocent. If you refuse, you are assumed to be guilty. I would like to see CSI do a careful study and expose the use of this polygraph flummery. Our government should be pressured to abandon such pseudoscience.

Other involvements in court cases where my personal expertise has been sought were either very minor or very similar to those I've stated here. Most of them involved gypsy-style swindles, which are the sort most often encountered, I believe, because they take advantage of strong religious and/or specific ethnic superstitions. Again, religion is behind so many of our species' problems of accepting reality.

Nothing new in that statement.

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[NOTES ON A STRANGE WORLD MASSIMO POLIDORO

Massimo Polidoro is an investigator of the paranormal, lecturer, and cofounder and head of CICAP, the Italian skeptics group. His website is at www.massimopolidoro.com.

The Monster of Florence: Case Closed?

The Terrifying Story of the Most Infamous Ritual Murders in Italian History, Part 2

The story of the Monster of Florence, after consuming energies and investigative efforts on the inconclusive Sardinian lead (see previous column), forced the investigators to start from scratch—*almost*. On September 11, 1985, just three days after the last murder attributed to the serial killer, an anonymous person wrote to the police of San Casciano naming for the first time Pietro Pacciani, a violent peasant who had already been convicted for murder twenty-six years earlier, killing a man whom he had caught making out with his girlfriend. An initial search of his premises failed to find any incriminating evidence, however, and only on October 30, 1991, did Pacciani (who had since ended up in prison after raping his own daughters) receive notice that he was under investigation for the Monster's crimes.

A series of searches at Pacciani's house in Mercatale eventually led to the discovery of several objects, including bits of paper with plate numbers written on them, a .22 caliber cartridge, and some German-made objects, perhaps belonging to the young German men who became victims of the Monster while camping in the Italian countryside in 1983. There was no gun, but another anonymous person sent the police of San Casciano a spring guide rod, part of a .22 caliber pistol, wrapped in two strips of flowered fabric. It was the same type of cloth found in the house of the farmer's daughters. On January 16, 1993, Pacciani was arrested on charges of being the maniac killer.

Pacciani's bad temper was sparked immediately (in his hometown he was known as "The Flame"), and he had a way of speaking in a dialect so colorful that it almost makes him a sympathetic character. TV stations competed to broadcast his rambling monologues during the trial, and when it was over, Pacciani immediately entered popular imagination. His very name became synonymous with a crude and violent person.

The Second Investigation: The 'Pick-Nick Friends'

At the first-degree trial, Pacciani was sentenced to life imprisonment. He was found guilty of all the double murders, except the 1968 killing. On appeal, however, he was acquitted. But on December 12, 1996, the Supreme Court overturned this ruling. Meanwhile, Michele Giuttari, head of the Mobile Police Squad in Florence, began what would become known as the "second investigation" on the crimes of the monster.

Pacciani, in short, did not act alone but was helped by three friends: postman Mario Vanni (who was sentenced to life imprisonment on May 31, 1999), Giancarlo Lotti (sentenced to thirty years, later reduced to twenty-six) and Giovanni Faggi (released because of age limits and later acquitted). Added to these is Fernando Pucci, a man suffering from oligophrenia and therefore disabled, who admitted to the court having participated in some "pick-nicks" (voyeuristic outings) with his friends. Pucci testified in court against the others, placing them at the site of some of the crimes.

It was Vanni who coined the expression that would become omnipresent in everyday language: "pick-nick friends." Pacciani, himself, and the others—he explained—only went "pick-nicking together," as if to say that they knew each other but did not do anything wrong. The phrase has remained so impressed in popular culture that today, in Italy, calling someone a "pick-nicking friend" is a crime. The Supreme Court (sentence 6699) ruled in a defamation case that "the allusive expression and negative connotation of 'pick-nicking friend' appears as a suggestive and ironic synonymous with persons of ill repute who plot in secret."

During the trial, Lotti at first denied any involvement but then confessed to having participated in the crimes. The motive, he claimed, was money: a mysterious client "ordered" human remains in exchange for money. During a new search of Pacciani's house, a roll of postal bonds valued at ninety-five million liras (the equivalent of around $100,000 at the time) was found hidden in a niche carved into a wall.

On September 26, 2000, the Supreme Court delivered the final sentences for Vanni (he was released on April 14, 2004, for health reasons and died in 2009) and for Lotti (who died in 2001). Pacciani, waiting to face the new appeal trial, suddenly left the scene: on February 22, 1998, he was found dead, apparently

of a heart attack, at his home in Mercatale Val di Pesa. In March 2001, however, the prosecutor of Florence opened a case against unknown persons with the hypothesis of murder. According to the investigative hypotheses, Pacciani may have been poisoned. But by whom?

The Third Investigation: The 'Second Level'

After the convictions of the "pick-nicking friends" as the material perpetrators of the notorious crimes, in the summer of 2000 the investigation on the alleged masterminds began. A "second level," suggested the investigators, was in fact a group of as-yet unsuspected professionals commissioning the crimes. These people would belong to an occult sect who used the parts removed from the bodies of the murdered girls in the course of rituals based on orgies and Satanic rites.

The investigations pointed to Francesco Calamandrei, a former pharmacist of San Casciano, considered the mastermind of at least four of the last murders, and perhaps even involved in the killing of Pacciani. Accusing him was his ex-wife, Mariella Ciulla, who spoke of having seen Calamandrei return home wounded after one of the murders, and to have found years earlier a Beretta .22 and some human parts in the refrigerator. The house of the former pharmacist was searched, but no evidence was found.

The case of the Monster of Florence is also connected to the investigation of the death of a doctor from Perugia, Francesco Narducci, whose corpse was recovered in Trasimeno Lake in October 1985, a month after the last double murder. At the time, there was talk of death by drowning, but a new autopsy revealed that the man was in fact strangled and that, therefore, there must have been a substitution of corpses during the earlier forensic analysis.

Other details thicken the mystery: Narducci had disappeared from the hospital where he worked on October 8, 1985, after receiving a mysterious phone call. Who called him? And what did they tell him? And then where did he go? And again, who replaced his body with that of another dead person in Trasimeno Lake, trying to thwart the investigation? And why was the father of Narducci, a powerful man in Perugia, opposed to the autopsy? And why would the former superintendent Francesco Trio and Colonel of the Carabinieri, Francesco Di Carlo, at the time commander of the Police unit of the Umbri capital, who was then under investigation, help Ugo Narducci to pass his son's death as an accident?

The assumptions on which the investigators worked was that Narducci, who seems to have been in a close relationship with Calamandrei, was part of the alleged sect who "ordered" Pacciani and fellow criminals to kill and cut up the victims. In addition, according to unconfirmed revelations, a sort of "super-witness," a well-known Freemason of Perugia, had discovered that his friend Narducci "had the degree of 'fetish guardian' in the sect," meaning that he was the one preserving the human remains from the Monster murders and that he "was finally killed for events related to these crimes. He knew everything, so maybe they were afraid he would talk" (Santoro 2002).

The investigation also ended up casting suspicion on a reporter, Mario Spezi, who had been following the events of the Monster since the beginning of the case but was skeptical about the "satanic cult" conspiracy hypothesis pursued by the prosecutors. However, he was not the only one to show some doubts: "Those of the Monster cannot be group crimes," says criminologist Francesco Bruno, who was part of the Pacciani defense. "There are two elements that contrast strongly: the first is that there has never been a serial killer acting on commission; it never existed. Secondly, satanic sects in Italy, to my knowledge, have never killed anyone in a deliberate way" (Selvatici 2001).

Spezi's arrest, with the accusation of helping and abetting the suspects, caused a sensation around the world and appeared to be an attempt to curb freedom of the press. However, the Court of Review canceled the arrest and three weeks later Spezi was freed.

Spezi, Calamandrei, and all the other defendants in the story of the death of Narducci were acquitted by prosecutor Giulio Mignini. In 2008, Calamandrei was also acquitted of any involvement in the crimes of the Monster of Florence. The prevailing belief is that the charges were fabricated by his ex-wife as revenge against him for leaving her for a younger woman.

Case Closed?

To date, the legal system has not succeeded in establishing any esoteric motive for the crimes. While Vanni and Pacciani had contacts with Salvatore Indovino, a fortune teller and palm reader, it is also true that the investigation did not find any evidence against people other than the "pick-nicking friends."

Lotti's statement, according to which the "body parts" had been requested by mysterious instigators, is merely one of the many explanations given for their crimes: on other occasions, he had stated that the murders were a revenge against women who had rejected them, or that the human remains were taken by Pacciani with the intent of forcing his daughters to eat them. The seemingly incriminating "treasure" of the Monster found in the wall is perfectly explainable, considering that Pacciani rented an apartment and, in addition to his normal work, performed several undeclared jobs; as for his companions, not one of them died a wealthy man.

This ugly story, then, would seem to shrink in the end to the attempts of a disturbed man to satisfy his own perversions and to the state of submission that led other equally sick men to follow him. This case is further confirmation of the fact that "evil" almost never has the *physique du role* that literature, cinema, or even journalism generally give it. For each refined and brilliant Hannibal Lecter, the cannibal serial killer created by writer Thomas Harris, the real world reveals the squalor and the banality of people like Pietro Pacciani and his sad pick-nicking friends.

References

Santoro, R. 2002. Mostro di Firenze, dieci nuovi sospettati. *Il Messaggero* (December 7).

Selvatici, F. 2001. E l'esperto di serial killer giurò sull'innocenza di Pacciani. *La Repubblica* (September 5).

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Evolution in the College Classroom

Facilitating Conversations about Science and Religion

For most American college students, their first serious encounter with the theory of evolution may come as part of an introductory biology course. As surprising as this might sound, the unfortunate reality is that in many high schools across the country evolution is often avoided or covered superficially as part of a crammed science curriculum, taught by teachers who are underqualified and poorly supported (Friedrichsen et al. 2016).

The lack of prior familiarity with evolution presents a particular challenge to religious students who are likely to have questions about how to reconcile what they are learning in the college classroom with their own faith. Surveys indicate that more than half of all students enrolled in introductory biology courses believe in God and consider themselves religious. If their questions about science and faith go unaddressed as part of their coursework, research suggests that learning is likely to be inhibited. Even though a religious student may successfully complete exams and assignments that test their knowledge of evolutionary science, their scores may not reflect a deeper *acceptance* of what they learned. These students may leave a course still doubting whether evolution is the best (and only) scientific explanation for the diversity of life on Earth (Barnes and Brownwell 2016).

Because of their experience in introductory biology courses, many religious students may also be turned off from pursuing a career in science. Studies indicate that students are more likely to choose a science career if they feel a sense of belonging as part of their coursework. Yet for many religious students, prevailing cultural cues tell them that science and religion are in conflict and that religious people lack competence or ability in science. Research shows that these false stereotypes, which are sometimes voiced by their instructors and peers, can harm the performance of religious students on science exams, further eroding their interest in science (Rios et al. 2015).

Much of student uncertainty about evolution may be caused by a lack of awareness of church teaching or doctrine on the matter. Most major religious traditions, including the Roman Catholic church, the Mormon church, and mainline Protestant churches, have either a neutral or explicitly affirmative

stance on evolution, acknowledging the consistency with church doctrine (National Academy of Sciences 2008). In other religious traditions such as evangelicalism, high-profile scientists such as Francis Collins (2006) have broken ranks with church doctrine to discuss openly how they reconcile science with their Evangelical faith. For conservative Christian students, research indicates that having such a role model is a key contributor to their acceptance of evolution (Manwaring et al. 2015).

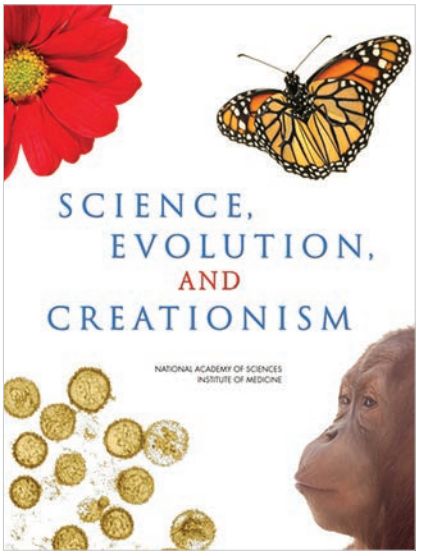
Unfortunately, most faculty members in the life sciences are not prepared to adequately address the questions that religious students hold about the connections between science and faith. Surveys show that the great majority of life science faculty are nonreligious, and that many equate religious belief with fundamentalism, assuming that faith by definition is in conflict with science. Moreover, when asked, most do not see religion as a topic appropriate for a science course. Even those instructors who want to facilitate more thoughtful classroom conversations about science and religion often lack the confidence and training to do so effectively, and they therefore avoid the topic (Barnes and Brownwell 2016).

For these reasons, in recent years, researchers have begun to test approaches embedded in introductory biology courses for facilitating more constructive conversations about science and religion that promote student acceptance of evolution. The findings point to promising models for instructors to adopt and offer insight on strategies for encouraging more constructive public dialogue about science and religion more generally.

Getting Beyond Conflict

In a study conducted at Arizona State University, instructors led ninety-five students enrolled in an introductory biology course through a two-week module focused on science, evolution, and religion. In addition to chapters from their textbook on natural selection and speciation, students were also required to read *Science, Evolution, and Creationism*, a booklet published by the U.S. National Academy of Sciences (2008).

The National Academy booklet was intended for use by scientists, teachers, parents, and school board members who wanted to engage in more constructive conversations with others who remain uncertain about evolution and its place in the public school curriculum. To



guide their efforts, the National Academy commissioned focus groups and a national survey to gauge the public's understanding of the processes, nature, and limits of science. The authoring committee also wanted to test various frames of reference that explained why alternatives to evolution were inappropriate for science class (Labov and Pope 2008; Nisbet and Scheufele 2009).

The committee had expected that a convincing storyline for the public would be a traditional emphasis on past legal decisions and the doctrine of church-state separation. Yet the data revealed that audiences were not persuaded by this framing of the issue. Instead, somewhat surprisingly, the research pointed to the effectiveness of defining evolutionary science in terms of social progress, explaining its role as a building block for advances in medicine and agriculture. The research also underscored the effectiveness of reassuring the public that evolution and religious faith can be fully compatible.

In light of this feedback, the National Academy committee decided to structure the final version of the report around these main points of emphasis. "The evidence for evolution can be fully compatible with religious faith," states the report. "Science and religion are different ways of understanding the world. Needlessly placing them in opposition reduces the potential of each to contribute to a better future."

In the Arizona State experiment, drawing on themes from the booklet, instructors emphasized that "scientists study natural causes within the natural world, whereas religious ideas address questions of morality, purpose, and the existence of a higher power." If religious beliefs were limited to questions of purpose, ethics, and the existence of God, then they were not in conflict with evolution.

In recent years, researchers have begun to test approaches embedded in introductory biology courses for facilitating more constructive conversations about science and religion that promote student acceptance of evolution.

To evaluate the impact of the module, surveys were administered to the class before and after the module was completed. In contrast to the more than 50 percent of students at the start of the module who said they perceived religion

and evolution as in conflict, only 26 percent said the same at the end, indicating that the module had reduced by nearly half the number of students holding a "conflict" outlook. More specifically, eleven out of the thirty-two students who said they perceived conflict at the start of the course shifted their outlook. Among those who were unsure at the start, eight out of fifteen indicated that evolution and religion were compatible after completing the module. Interestingly, there was no observable change in student scores on measures of religiosity (Barnes et al. 2017).

For most college students, the introductory courses they take during their first few college years may be the only thoughtful discussions of science and religion that they can draw on for the rest of their adult lives.

In a second study conducted at Brigham Young University, researchers focused specifically on how Mormon students—if informed of the Mormon church's official neutral position on evolution—may be more likely to subsequently accept evolutionary theory. In this case, the Mormon Church maintains strict belief in God as the creator, but in its statements it does not confirm or deny the potential for theistic evolution, leaving room for Mormons to adopt a scientific interpretation. The experiment involved more than 1,500 nonmajors enrolled in introductory biology courses. In the test condition, as part of the semester, students participated in at least one lecture and discussion of a "BYU Evolution Packet" that discussed the official Mormon church stance on human origins. After reading the packet, during the class discussion, students were encouraged to ask questions and make comments. The control condition had access to the BYU Evolution Packet, but no time was spent as part of the course in discussing the packet (Manwaring et al. 2015).

For both the experimental and control conditions, overall student acceptance of evolution increased across the semester, and this greater level of acceptance remained five to seven months after completion of the course. But in the experimental condition that included the lecture on official Mormon teachings, gains in acceptance of evolution were significantly higher than in the control condition. As the researchers note, at the outset of the course, those students who held more misconceptions about the Mormon church's stance on evolution were some of the least likely to accept the theory of evolution. Their analysis indicates that the booklet and single lecture on the topic corrected many of these misconceptions among the participating students, which in turn led to the higher gains in student acceptance of evolution in comparison to the control condition (Manwaring et al. 2015).

Conclusion

For most college students, the introductory courses they take during their first few college years may be the only thoughtful discussions of science and religion that they can draw on for the rest of their adult lives. If these students leave a science course lacking a strong motivation for further information on the topic, they can easily avoid the many available popular science books, articles, and films. When they do incidentally come across coverage in the news media, evolution is most likely to be framed in terms of controversy and irreconcilable conflict with religion (Mooney and Nisbet 2005).

We tend to think about general science education at the college level as a vehicle for imparting knowledge about the physical world, particularly in terms of basic science literacy. But general education science courses should also serve a core civic purpose, imparting critical understanding of the complex relationship between science and society, modeling for students' thoughtful ways to negotiate differences. The first few studies formally evaluating approaches to discussing evolution and religion are models to build on. More research is needed to expand the evidence-base specific to evolution and to evaluate approaches for effectively discussing other challenging topics such as climate change or gene editing.

References

Barnes, M.E., and S.E. Brownell. 2016. Practices and perspectives of college instructors on addressing religious beliefs when teaching evolution. *CBE-Life Sciences Education* 15(2).

Barnes, M.E., J. Elser, and S.E. Brownell. 2017. Two-week evolution module reduces perceived conflict between evolution and religion for religious and non-religious students. *American Biology Teacher* 79(2): 104–111.

Collins, F.S. 2006. *The Language of God: A Scientist Presents Evidence for Belief*. New York: Simon and Schuster.

Friedrichsen, P.J., N. Linke, and E. Barnett. 2016. Biology teachers' professional development needs for teaching evolution. *Science Educator* 25(1).

Labov, J.B., and B.K. Pope. 2008. Understanding our audiences: The design and evolution of science, evolution, and creationism. *CBE-Life Sciences Education* 7(1): 20–24.

Manwaring, K.F., J.L. Jensen, R.A. Gill, et al. 2015. Influencing highly religious undergraduate perceptions of evolution: Mormons as a case study. *Evolution: Education and Outreach* 8(1): 23.

Mooney, C., and M.C. Nisbet. 2005. Undoing Darwin. *Columbia Journalism Review* 44(3): 30–39.

National Academy of Sciences. 2008. *Science, Evolution, and Creationism*. Washington, DC: The National Academies Press. Available online at https://www.nap.edu/catalog/11876/science-evolution-and-creationism.

Nisbet, M.C., and D.A. Scheufele. 2009. What's next for science communication? Promising directions and lingering distractions. *American Journal of Botany* 96(10): 1767–1778.

Rios, K., Z.H. Cheng, R.R. Totton, et al. 2015. Negative stereotypes cause Christians to underperform in and disidentify with science. *Social Psychological and Personality Science* 6(8): 959–967.

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P-Hacker Confessions: Daryl Bem and Me

Cornell University psychologist Daryl Bem and I have something in common. Yes, we are both research psychologists, but that's not what I mean.

For me, it started when I was just a young graduate student. Statistics courses are a standard part of graduate training in psychology, because statistical methods are still the coin of the realm in psychological research. Most graduate students are required to conduct empirical research as part of their doctoral dissertations, and if they go on to academic positions, they often continue to do quantitative studies throughout their careers. Training in statistics is important because statistical number crunching techniques are the way we determine whether our results mean anything or not. Most of my graduate school cohort hated anything that looked like math, but—to my surprise—I discovered that I liked statistics courses. I took more of them than were required, and my relatively strong background in stats was an important factor in landing an academic position. (Let that be a lesson to any psychology students who might be reading this.) In graduate school, I coached my math-phobic friends on how to enter data into the computer and analyze it, and in my academic life, I did the same with students and colleagues.

With all this background, I got to be pretty good at statistical consulting, and as a result, needy researchers often came knocking. Publishing trends are gradually changing, but even now, most studies need to report statistically significant results to have any chance of getting published. Journal editors are much less interested in studies in which nothing happened, so everyone is on a quest to achieve the vaunted p (for probability) < .05 that indicates the findings are unlikely to have happened by chance. When a friend's research or my own appeared to have come up short, I was pretty good at salvaging something from the rubble. I might suggest altering the design of the study by combining data from previously separated groups of participants, or massaging the numbers in some way. These were techniques I'd learned at my mentors' knees, and although we had some inkling that we were fudging the results a bit, we consoled ourselves by openly reporting the steps we'd gone through and supplying some plausible-sounding justification for each manipulation. We didn't think we were doing anything wrong.

But now we know better. Today, the process I just described is called "p-hacking," a pejorative term that suggests an unethical manipulation of data in search of statistical significance. We also know that admitting you manipulated your data is not like going to confession. It doesn't wash away the sins of p-hacking, and in the modern world of research, it is no longer acceptable. Most reputable journals will not accept an article based on such questionable techniques. Recent research aimed at trying to replicate previously published psychology studies has demonstrated—shockingly—that a large number of classic phenomena cannot be reproduced, and the popularity of p-hacking is thought to be one of the culprits.

Textbooks will have to be rewritten in light of this "reproducibility crisis," but there has also been a very positive outcome. In just a very few years, the standards for psychology research have been ratcheted up substantially with the introduction of the "open science" movement, which urges researchers to publicly state their plans for a study before they start data collection. Methods and results are also publicly posted so that it is harder to fudge your data and other researchers can reanalyze your results if they wish. Journals and professional organizations have quickly endorsed the principles of open science, which is spreading far beyond the field of psychology. I wrote about the open science movement in my December 2016 online column, "The Parable of the Power Pose and How to Reverse It" (Vyse 2016).

Daryl Bem, P-Hacking, and the Paranormal

Daryl Bem is unquestionably one of the world's most fascinating psychologists. His career spans five decades during which he's made substantial contributions to the field. He got a BA in physics from Reed College, but when the civil rights movement got underway in the 1960s, he changed fields and earned a PhD in social psychology at the University of Michigan. He went on to teach at Stanford, Carnegie Mellon, Harvard, and ultimately Cornell University (Bem Nd.). His early contributions include *self-perception theory*, which offered an alternative interpretation of the phenomenon we know as cognitive dissonance, and

Daryl Bem speaking at CSICOP's first international conference in Buffalo, New York, in October 1983 in a session on "Why People Believe." (Photo by Robert Sheaffer. Photo Source: Wikipedia)

the exotic becomes erotic theory of sexual orientation, which suggested that biological differences in sexual orientation are mediated by early childhood experiences (Bem 1996).

Even Bem's personal life, about which he has been exceedingly open, is remarkable. When he first met his future wife, Sandra, in the mid-1960s, he reportedly told her two things: that he was from Colorado and that his sexual preference was primarily homoerotic. She replied that she had never met anyone from Colorado before (Nussbaum 1998).

From the beginning, they committed to a completely egalitarian and gender nonconforming partnership, long before this kind of marriage was fashionable, and they held to these principles while raising their two children. In 1972, the couple was profiled in an article called "A Marriage of Equals" for the first issue of *Ms.* magazine. Sandra became an eminent feminist scholar, author of the Bem Sex Role Inventory, and director of the women's studies program at Cornell. In the mid-1990s, the couple separated amicably but remained married, and both went on to have same-sex relationships (Nussbaum 1998). Through it all, they remained close, as Sandra recounted in her memoir *An Unconventional Family* (Bem 1998). In 2009, when Sandra began to show the signs of Alzheimer's disease, she resolved to take her own life before she became too ill to be capable of the act. Her death, which was documented in a *New York Times Magazine* story, happened on May 20, 2014, with Daryl at her side (Henig 2015).

A "receiver" in a Ganzfeld experiment sitting in a comfortable chair. Halves of pingpong balls cover the participant's eyes, white noise is played through their ears, and the entire area is bathed in red light. (Photo Source: Wikipedia)

Is Psi Real?

The foregoing already describes a remarkable life and career, but it is unlikely Daryl Bem will be best remembered for these things. His most widely publicized work has been in extrasensory perception, where he represents the rare combination of an accomplished mainstream psychologist who is also a believer.

Like much of his life and career, Bem's path to ESP was somewhat unique. Beginning when he was just a young boy, Daryl was fascinated with magic shows, and as a teenager he amused his friends with magic tricks. He continued to dabble in magic and used it for demonstrations in his classes, but unlike The Amazing Randi, Banachek, or Penn & Teller, Bem's interest in magic eventually led him to belief rather than to skepticism.

Bem was invited to perform some mentalism tricks at a meeting of the Parapsychological Association, where he met Charles Honorton (Tsakiris 2012). Honorton had set up a lab where he was doing mental telepathy experiments using the Ganzfeld technique, which employed sensory deprivation to sift out noise in the hope of allowing weak telepathic signals to be received. Bem was impressed with Honorton's work, and in 1994 he and Honorton coauthored a meta-analysis of Honorton's Ganzfeld data titled "Does Psi Exist: Replicable Evidence for an Anomalous Process of Information Transfer." The article, which appeared in the prestigious journal *Psychological Bulletin*, purported to show an overall correct reception rate of 32 percent, which was statistically greater than the chance expectation of 25 percent on a four-choice test (Bem and Honorton 1994).

As you might expect, Bem and Honorton's Ganzfeld study caused quite a stir in the scientific community. Most of the earlier ESP research had been published in parapsychology journals that were viewed with skepticism by mainstream psychology. Here was a highly respected scientist publishing evidence of psi in one of psychology's most respected journals, and for the first time ESP was getting a serious look.

CSI Fellow Ray Hyman, who earlier published a joint paper with Honorton suggesting additional experimental controls for future Ganzfeld studies (Hyman and Honorton 1986), wrote a critique of Bem's statistical methods in the same issue of *Psychological Bulletin* (Hyman 1994), and many other critiques followed. In 1999, CSI Fellow Richard Wiseman and coauthor Julie Milton published a meta-analysis of eleven new Ganzfeld studies, comprising more participants than in the Bem and Honorton article, and found no significant psi effect (Milton and Wiseman 1999). These studies were followed by much back and forth (see, e.g., Storm and Ertel 2001), but the current state of the Ganzfeld debate does not support the reality of psi (Bierman et al. 2016).

Feeling the Future

For his next big foray into psi research, Bem conducted his own research at

Cornell over a period of ten years. The resulting 2011 paper, "Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect," which included nine different experiments, was published in another very prestigious journal and purported to show evidence that future events could influence the present (Bem 2011). According to Bem, participants who were asked to predict whether an object would be behind one of two curtains showed choices that were influenced by events that happened after they made their selections.

This time the media reacted in a big way. Many newspaper articles were written about the study, and even before it appeared in print, Bem was invited on *The Colbert Report*.

As in the past, skeptics responded to Bem's 2011 paper. CSI Fellow James Alcock wrote a highly critical review in Skeptical Inquirer (Alcock 2011), and Ray Hyman called the publication "crazy" in an article in *The New York Times* (Carey 2011). Finally, last summer, Bem and two coauthors reported the results of a preregistered replication that was conducted using the more rigorous methods of open science (Engber 2017). Unfortunately, the results were negative: no evidence of feeling the future effect.

Traditionally, Bem has been a staunch defender of his work, responding to every criticism, but lately he seems to be softening. In May 2017, Daniel Engber wrote an extensive article on Bem's parapsychological research for *Slate*, in which Bem came remarkably close to an outright admission of p-hacking:

> "I'm all for rigor," he continued, "but I prefer other people do it. I see its importance—it's fun for some people—but I don't have the patience for it." It's been hard for him, he said, to move into a field where the data count for so much. "If you looked at all my past experiments, they were always rhetorical devices. I gathered data to show how my point would be made. I used data as a point of persuasion, and I never really worried about, 'Will this replicate or will this not?'" (Engber 2017)

I hear a bit of weariness in this statement—perhaps the sentiments of a battered researcher near the end of his career—and to some extent, it is a feeling I can understand. The standards for research are changing rapidly, and after a career of doing things a certain way, it is a daunting task to retool in the new procedures of open science. Like Bem, my empirical research days are mostly behind me now, and part of me is relieved to get out before having to confront the new research realities. Open science is a welcome and hugely important development. It may end up being the salvation of psychological science. But, like Bem, part of me is happy to leave it to younger researchers.

If there is an upside for Bem, it might be that, in retrospect, he has been given substantial credit for stimulating the movement to tighten the standards for research. In the 2011 paper, he chose methods that he knew would be easy for other researchers to use, and he has been quite vocal in encouraged replication. Some observers, including Jade Wu, who was a research assistant on the 2011 study, have voiced the opinion that this was all a deliberate plan to expose the failings of the field and spark a movement for reform: "I still think it's possible that Daryl Bem did all of this as a way to make plain the problems of statistical methods in psychology," Wu is quoted as saying in the Engber article (Engber 2017).

Bem brushes off these suggestions, minimizing his role: "I get more credit for having started the revolution in questioning mainstream psychological methods than I deserve," Bem told Engber. "I was in the right place at the right time. The groundwork was already pre-prepared, and I just made it all startlingly clear" (Engber 2017).

Whatever Bem's personal role might be in the new wave of rigor in psychology, two things are abundantly clear: p-hackers like Bem and me are out of business, and science is better for it. ■

References

Alcock, James. 2011. Back from the future: Parapsychology and the Bem affair. Skeptical Inquirer 35(2): 31–39. Available online at http://www.csicop.org/specialarticles/show/back_from_the_future; accessed June 6, 2017.

Bem, Daryl. Nd. Daryl Bem: Brief Biography. Available online at http://dbem.ws/bem_bio.htm; accessed June 6, 2017.

———. 1996. Exotic becomes erotic: A developmental theory of sexual orientation. *Psychological Review* 103(2): 320–35. doi:10.1037/0033-295x.103.2.320.

———. 2011. Feeling the future: Experimental evidence for anomalous retroactive influences on cognition and affect. *Journal of Personality and Social Psychology* 100(3): 407.

Bem, Daryl J., and Charles Honorton. 1994. Does psi exist? Replicable evidence for an anomalous process of information transfer. *Psychological Bulletin* 115(1): 4–18. doi:10.1037//0033-2909.115.1.4.

Bem, Sandra L. 1998. *An Unconventional Family*. New Haven: Yale University Press.

Bierman, Dick J., James P. Spottiswoode, and Aron Bijl. 2016. Testing for questionable research practices in a meta-analysis: An example from experimental parapsychology. *Plos One* 11(5). doi:10.1371/journal.pone.0153049.

Carey, Benedict. 2011. Journal's paper on ESP expected to prompt outrage. *The New York Times* (January 5). Available online at http://www.nytimes.com/2011/01/06/science/06esp.html; accessed June 5, 2017.

Engber, Daniel. 2017. Daryl Bem proved ESP is real. Which means science is broken. *Slate Magazine* (May 17). Available online at https://redux.slate.com/cover-stories/2017/05/daryl-bem-proved-esp-is-real-showed-science-is-broken.html; accessed June 5, 2017.

Henig, Robin Marantz. 2015. The last day of her life. *The New York Times* (May 14). Available online at https://www.nytimes.com/2015/05/17/magazine/the-last-day-of-her-life.html; accessed June 4, 2017.

Hyman, Ray. 1994. Anomaly or artifact? Comments on Bem and Honorton. *Psychological Bulletin* 115(1): 19–24.

Hyman, Ray, and Charles Honorton. 1986. A joint communiqué: The psi Ganzfeld controversy. *The Journal of Parapsychology* 50(4): 351.

Milton, Julie, and Richard Wiseman. 1999. Does psi exist? Lack of replication of an anomalous process of information transfer. *Psychological Bulletin* 125(4): 387–91. doi:10.1037//0033-2909.125.4.387.

Nussbaum, Emily. 1998. Emily Nussbaum: Does the Exotic Become Erotic? Emily Nussbaum, Writer. Reprinted from *Lingua Franca*, May/June. Available online at http://www.emilynussbaum.com/lingua_franca/1998/05/does_the_exotic_become_erotic.php; accessed June 4, 2017

Storm, Lance, and Suitbert Ertel. 2001. Does psi exist? Comments on Milton and Wiseman's (1999) meta-analysis of Ganzfield research. *Psychological Bulletin* 127(3): 424–33.

Tsakiris, Alex. 2012. Dr. Daryl Bem responds to parapsychology debunkers. *Skeptiko* (May 4). Available online at http://skeptiko.com/daryl-bem-responds-to-parapsychology-debunkers/; accessed June 4, 2017.

Vyse, Stuart. 2016. The parable of the power pose and how to reverse it. CSICOP.org (December 15). Available online at http://www.csicop.org/specialarticles/show/the_parable_of_the_power_pose_and_how_to_reverse_it; accessed June 6, 2017.

[SKEPTICAL INQUIREE BENJAMIN RADFORD

Benjamin Radford is a research fellow at the Committee for Skeptical Inquiry and author or coauthor of ten books, including *Bad Clowns*.

Orbs as Plasma Life

Q: **I contacted you about my video evidence over two years ago and have continued to video my orb/plasma life forms. My file contains over fourteen hours of video and pictures. I started a YouTube channel to show some of my video; please look at them and let me know what you think.**

—Randy C.

A: I got the above email earlier this year, one of a continual stream of requests for me to review evidence, offer advice, or investigate some apparent anomaly or other. I'm unable to offer a personal reply to everyone who contacts me, but sometimes the queries can offer useful insights into less-than-skeptical worldviews and possibly help others become better critical thinkers through some simple questions and suggestions.

Randy included a link to his YouTube channel, and during a lunch break I clicked on a few of the videos, hoping to be impressed. By the end of my turkey sandwich and Diet Dr. Pepper, I had a pretty good idea where it was going and dashed off a quick reply:

> Hello Randy, thanks for getting ahold of me. I'm busy on deadline but had a few minutes to look at several of your videos. It would help me if you could briefly answer a few questions: 1) What do you think they are? 2) From my experience, most orb photos and videos are insects and dust caught in the light, and out of focus because they're close to the camera; how have you ruled out those explanations? and 3) Do you think they have a purpose or message?

I was intrigued by Randy's attribution of intention and intelligence to otherwise seemingly ambiguous movements in his videos. I'd seen it before, but rarely so clearly. Michael Shermer, author of several books, including *Why People Believe Weird Things*, calls this tendency to infer hidden agents in the world *agenticity*: "Examples of agenticity abound. Subjects watching reflective dots move about in a darkened room, especially if the dots take on the shape of two legs and two arms, infer that they represent a person or intentional agent. Children believe that the sun can think and follows them around, and when asked to draw a picture of the sun they often add a smiley face to give agency to it. Genital-shaped foods such as bananas and oysters are often believed to enhance sexual potency" (Shermer and Linse 2013).

In their book *Anomalistic Psychology: Exploring Paranormal Belief and Experience*, Christopher French and Anna Stone (2014) note that "Many ghost hunters will attribute intentionality to orbs, describing their 'behavior' as indicating intelligence. If the orbs appear to be close to a person in the picture, they are described as 'friendly.' If they are distant or few in number they are described as being 'shy'" (197). Yet when the true nature of orbs is understood, we realize that they are not in fact displaying any intent, intelligence, or human attributes; it is merely an illusion our mind imposes on the world. An orb appears in a specific spot in a photograph not because that's where someone died but because there happened to be a reflective object

in the background.

Randy wrote back promptly (edited here for brevity and clarity):

> I believe these life form entities are worthy of scientific study and public discussion. Both can only happen if the word gets out through video and print. In my opinion from my countless hours of observation I believe they are real; they are a living life form that is totally foreign to our understanding of life itself. They are plasma like … they have their own energy and can invoke invisibility at will. They can go through solid objects like we go through air. They have emotion.… They show curiosity; they are their own life species. Different sizes, different shapes. They make crackle and popping sounds when flying near the camera. Their movements are coordinated, sometimes smooth, sometimes erratic … but always with purpose. I think a whole book would be needed to explain all the wonderful things these entities display. I believe they are interdimensional beings … some are stand alone intelligence while others appear to be used to observe us, our planet, our very dimension. I use one room in my house mostly to film them. I call it the portal room. I can video them 24/7 from within this room. Not so much in other rooms although I do have some pretty mind-boggling video from other spots. But the portal room is a small … controlled area from dust and bugs and other foreign objects that could distort what I am filming. They definitely are here to observe. Ben, we are talking about a real alien life form possibly as old as the universe itself … not just part of this dimension but others as well. Don't you think these entities are worthy of some investigation, study, and publication?

I spent about twenty minutes reviewing some of his other videos more closely, taking notes in the process, especially looking for clues in the background of the rooms. The following day I replied:

> Thanks for getting back to me, I appreciate your thoughts and comments. To clarify, I'm not suggesting that the orbs you're seeing on video aren't 'real'—I suspect they are very real, and not, for example your imagination, or illusion, or a hoax. What I'm trying to figure out (and help you establish) is *what* they are, not just for my own curiosity but also to know how you should best proceed.
>
> Obviously I haven't seen them in person, and can only go by what you tell me and what you record. My advice is before speculating too much about the orbs' motivations, you need to first be sure that you are not recording small insects, dust, etc. because that will be one of the first things that researchers will look at, so you will need to show that you have ruled them out. I have seen many orb videos that turned out to be exactly those. It's even possible that some of the orbs really are something unknown, as you suggest, while others are 'ordinary' ones caused by dust, etc. If that's the case you'll need to find a way to distinguish between the two.

When the true nature of orbs is understood, we realize that they are not in fact displaying any intent, intelligence, or human attributes; it is merely an illusion our mind imposes on the world.

> You note that your Portal Room is small and "controlled area from dust and bugs and other foreign objects." However in some of your videos we can see many sources of dust, including curtains in front of a window and a door. I also see a cat perch and a dog or cat crate. Animals can be a source of dander and dust as well. Of course small insects and dust are very common, and found in almost all homes. The only places that are *completely* dust and insect free are clean rooms, such as those at medical and computer chip manufacturing plants. [Here I sent him links to information on industrial cleanrooms.] To truly control for dust and insects in that room you'd need to spend tens of thousands of dollars, use double-portal doors, etc., and I guarantee you no animals would be allowed anywhere near it!
>
> So that's impractical, but I do have several cheaper, lower-tech solutions that might help you distinguish what these orbs are and how to tell them from dust or insects.
>
> 1) If some of the orbs are really small flying insects, use an indoor insecticide fogger before recording, maybe two of them to be sure. If the orbs are interdimensional beings, some bug spray shouldn't bother them at all. On the other hand if the flying orbs stop, or decline steeply, that's good evidence that they were insects.
>
> 2) Set up one or two fans in the room so you can partly control the airflow. If the orbs move in the direction of the airflow, that means that they are being affected by it, and are therefore probably dust or insects. If the orbs fly against it, or are unaffected by it, that suggests they are something unknown. This experiment isn't perfect, and in a small room suspended or flying objects may go in different directions since the airflow is circulating, and to help minimize it the fan should be on low. But if most of the orbs are moving in more or less the same patterns, that's suggestive evidence. I hope this helps, and if you try these experiments please get back to me and let me know the results. You might also find my book *Scientific Paranormal Investigation: How to Solve Unexplained Mysteries* useful.

Somewhat to my surprise I got the following reply:

> Your two suggestions to eliminate the insect/dust possibility are good ones I will try while filming. I will attach streamers to the fan to show air movement and direction. I will be uploading some very good videos of plasma life in the next few days so please check them out on my YouTube channel. Thank you for your help and interest.

I never heard back, but Randy's YouTube channel remains populated with seemingly mysterious orb videos. ■

References

French, Christopher, and Anna Stone. 2014. *Anomalistic Psychology: Exploring Paranormal Belief and Experience*. London: Palgrave MacMillan.

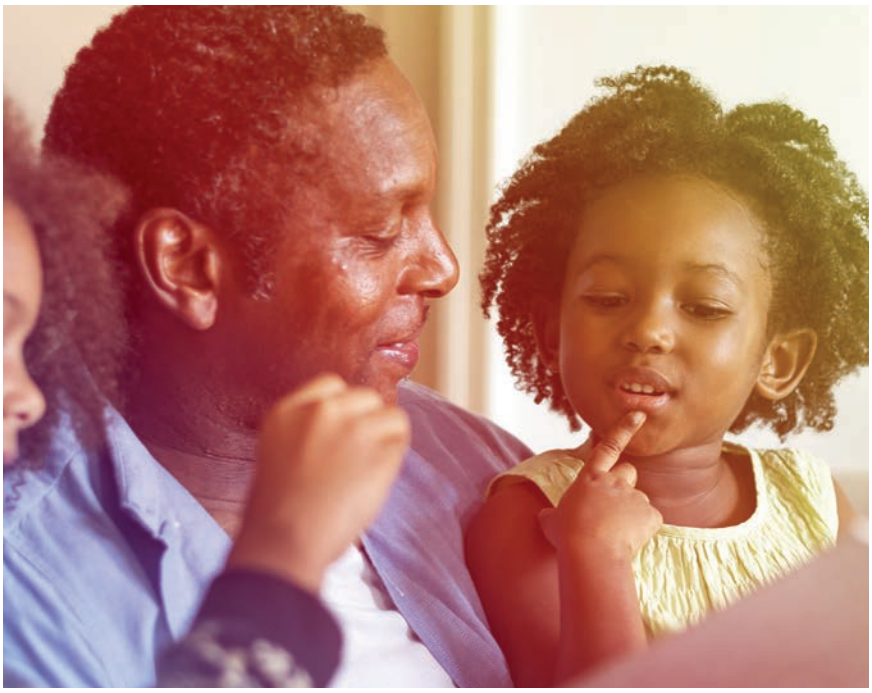
Shermer, Michael, and Pat Linse. 2013. *The Science Behind Why People See Ghosts*. The Skeptics Society. Available online at http://www.skeptic.com/downloads/why-people-see-ghosts.pdf.

Teaching Skepticism: How Early Can We Begin?

SCOTT O. LILIENFELD

I trust that I need not persuade readers of Skeptical Inquirer that in today's world of post-truth, alternative facts, and rampant pseudoscience, critical thinking—reasoning that helps to compensate for our biases—is needed now more than ever. Concerted efforts to dispel erroneous beliefs, as exemplified by the articles in each issue of this magazine, are essential to this mission. To effectively disseminate critical thinking to the broader populace, though, we may need to start earlier in our educational efforts than we have commonly assumed, perhaps as early as childhood.

Critical thinking and its close cousin, scientific thinking, do not come naturally to the human species (McCauley 2011). Hence, it is no surprise that many people, even those with high levels of education and intelligence, are not adept at evaluating claims with a skeptical mindset, one that requires us to maintain an open mind to novel claims while demanding persuasive evidence. In principle, there could even be a *sensitive period* for teaching critical thinking in childhood; once this window closes, critical thinking may be even more difficult to acquire. Still, developmental and educational psychologists know remarkably little about whether this is the case and if so, when we should begin to teach the rudiments of skepticism to children (see Scott O. Lilienfeld, "How Can Skepticism Do Better?," Skeptical Inquirer, September/October 2016). As a consequence, we do not know whether laudable efforts to expose young children to critical thinking skills (such as the Junior Skeptic feature in *Skeptic* magazine) are worthwhile. Perhaps we need to wait until children's cognitive capacities, such as their ability to think abstractly, are better developed. After all, as the great Swiss psychologist Jean Piaget noted, children are not merely "tiny adults." They often think about the world in qualitatively different (that is, different in kind rather than degree) ways from grown-ups.



More optimistically, some developmental psychologists contend that infants and young children are "scientists" in their approach to evaluating evidence (Gopnik et al. 2000). There is some truth to this view. Children form hypotheses about how the world works, conduct miniature "experiments" on the world, and draw inferences from them. At the same time, we should be careful not to take these findings too far. The assertion that science comes naturally to humans early in development is difficult to square with the late emergence of science in the history of the human species (Wolpert 1998).

With respect to the effectiveness of educating children in critical thinking, the glass is either half-full or half-empty depending on one's perspective. On the one hand, there are ample grounds for pessimism when it comes to teaching critical thinking to children. As Paul Bloom and Deena Weisberg (2007) observed in an important review, children display distinctive biases in thinking that may impede efforts to teach them science. For example, children are, in the words of Deborah Kelemen (1999), "promiscuously teleological": they see

purpose even in its absence. When asked why clouds exist, for instance, many four-year-olds respond, "to give us rain." As Michael Shermer (2009) noted, this propensity appears to live on in many adults in the form of *agenticity*—a proclivity to believe that natural phenomena are generated by intentional agents. Children are also natural-born *essentialists*. For example, they tend to perceive animal species as possessing unalterable essences, a belief that may in some cases hamper their ability to grasp the essentials of evolution by natural selection (Emmons and Kelemen 2015).

On the other hand, recent data raise the possibility that children may indeed be able to acquire basic critical thinking skills. For example, despite the tendency of young children to conceive of the world in essentialist terms, evidence suggests that they can be taught to grasp the tenets of natural selection. Using a story-book method that consisted of engaging pictures and narratives, Kelemen and colleagues (2014) found that five- to eight-year-old children could acquire the fundamental principles of Darwinian evolution (such as differential survival and reproduction and the resulting changes in the population frequency of characteristics), and that their newfound understanding persisted for at least several months. More broadly, a recent meta-analysis revealed that critical thinking instruction yielded small to moderate gains on standard critical thinking measures among elementary and middle school children (Abrami et al. 2015).

A new study provides still more reasons for cautious optimism (Nsangi et al. 2017). In an impressive investigation of over 10,000 pupils in Uganda aged ten to twelve, the authors examined the effectiveness of a teaching program designed to teach schoolchildren to distinguish well-supported from poorly supported health claims. By using a textbook that contained entertaining comic-book stories—supplemented by group exercises, singing, and other teaching tools—instructors taught students twelve key concepts relevant to evaluating assertions regarding medical treatments. These concepts included the idea that anecdotal evidence of improvement is fallible, that to evaluate the effectiveness of a treatment one must compare it with a control condition, and that participants should ideally be blinded to their condition assignment. Sixty schools received the intervention, and sixty served as a no-intervention control group. The intervention produced large effects on children's ability to understand core concepts regarding the evaluation of medical claims, with the effects being especially pronounced among those with high levels of reading ability.

Recent data raise the possibility that children may indeed be able to acquire basic critical thinking skills.

The study, although promising, has its limitations. The intervention was compared against a no-intervention control condition rather than an alternative teaching method, so some of the effects may have stemmed from nonspecific effects, such as attention or the generalized effects of any intensive teaching method. In addition, the items on the post-test were similar in content to those delivered during instruction, so some of the positive results could have reflected "teaching to the test." Further, it is unknown how well the effects will endure over the long term.

Moreover, the generalizability of these encouraging findings to other domains in which critical thinking is essential—such as bogus political and paranormal claims—remains to be seen. But against the backdrop of the rising prevalence of many pseudoscientific and otherwise unsupported beliefs in Western society, there is at last some good news: we may be able to begin to teach the tools of skeptical thinking at an earlier age than many scholars had believed. Schools would be wise to take notice. ■

References

Abrami, Paul C., et al. 2015. Strategies for teaching students to think critically: A meta-analysis. *Review of Educational Research* 85: 275–314.

Bloom, Paul, and Deena S. Weisberg. 2007. Childhood origins of adult resistance to science. *Science* 316: 996–997.

Emmons, Natalie A., and Deborah A. Kelemen. 2015. Young children's acceptance of within-species variation: Implications for essentialism and teaching evolution. *Journal of Experimental Child Psychology* 139: 148–160.

Gopnik, Alison, Andrew N. Meltzoff, and Patricia K. Kuhl. 2000. *The Scientist in the Crib: What Early Learning Tells Us about the Mind*. New York: William Morrow Paperbacks.

Kelemen, Deborah. 1999. The scope of teleological thinking in preschool children. *Cognition* 70: 241–272.

Kelemen, Deborah, Natalie A. Emmons, Rebecca Seston Schillaci, et al. 2014. Young children can be taught basic natural selection using a picture-storybook intervention. *Psychological Science* 25: 893–902.

McCauley, Robert. N. 2011. *Why Religion Is Natural and Science Is Not*. New York: Oxford University Press.

Nsangi, Allen, et al. 2017. Effects of the Informed Health Choices primary school intervention on the ability of children in Uganda to assess the reliability of claims about treatment effects: A cluster-randomised controlled trial. *The Lancet*. Available online at http://www.sciencedirect.com/science/article/pii/S0140673617312266.

Shermer, Michael. 2009. Agenticity. *Scientific American* 300(6): 36.

Wolpert, Lewis. 1998. *The Unnatural Nature of Science*. Cambridge, MA: Harvard University Press.

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Predatory Journals: Write, Submit, and Publish the Next Day

RAMZI HAKAMI

In 2012, journalist John Bohannon of the respected journal *Science* submitted a fictitious research paper to 304 open-access journals, of which 157 accepted his paper for publication. Bohannon used a fake name (Ocorrafoo Cobange) and a fake affiliation (Wassee Institute of Medicine); created a database of cancer cells, molecules, and lichens; and generated hundreds of unique papers using a computer program. The scientific content of each paper was identical and contained so many "grave errors that a competent peer reviewer should easily identify it as flawed and unpublishable" (Bohannon 2013).

In March 2017, another respected journal, *Nature*, carried out its own sting operation. It submitted a fake application for an editor position, a person woefully unqualified, to 360 journals, a mix of legitimate journals and suspected predatory journals. Forty-eight of the latter accepted her for the job, many on condition of paying a fee or donation first (Sorokowski et al. 2017).

Predatory journals can be defined as "publications [that take] large fees without providing robust editorial or publishing services." They usually "recruit articles through aggressive marketing and spam emails, promising quick review and open access publication for a price. There is little if any quality control and virtually no transparency about processes and fees. Their motive is financial gain, and they are corrupting the communication of science. Their main victims are institutions and researchers in low and middle income countries ..." (Clark and Smith 2015).

Unfortunately, fake journals have increased aggressively and succeeded in establishing their positions in the world of academic writing, which may lead, if they remain unquestioned, to what Frank Truth calls "academic racketeering" (Truth 2012).

In 2010, a librarian at the University of Colorado, Jeffrey Beall, developed a list of "predatory open-access journals" (Beall 2012; 2017). At the beginning, there were only twenty journals on his blacklist, but by 2013 the number exceeded 300 (Kolata 2013). One on Beall's list of "questionable, scholarly open-access publishers" (Beall 2017) is the journal of choice among many of my undergraduate colleagues and even professors who used to be very happy when they received the acceptance letter and request to pay not more than $50. It seemed to me like charity, and I wanted to be one of those lucky international researchers publishing via this "Research Publish Journals" organization (http://www.researchpublish.com/).

Day #1: A Well-Organized Website and a Prestigious Editorial Board

The first marketing bubble I found at researchpublish.com was this question "Why choose us?" I was very suspicious when I read one of their answers: "Presence of large numbers of if's and buts in paper submission process of other Journals require lots of effort of authors unnecessarily." I stopped reading and said to myself: "What a wonderful beginning!" As any English beginner would notice, there are many grammar and writing mistakes in addition to the poor writing quality. I was not shocked because I expected that.

I continued reading, ignoring more and more terrible mistakes that should alert any serious researcher that he or she is probably going to waste their efforts and time by submitting a paper to such a journal. In scientifically sound and reputable journals there must be "ifs" and "buts." A paper cannot be accepted for review until it passes many phases of checks and evaluations of its readiness to be peer-reviewed. However, predatory journals (such as Research Publish Journals) do not require good English, real affiliations, or even ethical clearance. They primarily "do not reject any paper!," and to be considered, papers should only meet their easy "Research Publish Journals format." So, what did I do?

I used real data of mine and modified them to show clearly observable fatal mistakes in simple mathematics and English grammar. I also purposely kept many epidemiological facts without citations and declared that *I do not have any ethical clearance*. These clearly distinguishable flaws were generated to test a hypothesis that Research Publish Journals' editorial board does not exist—or if it exists, it does not spend a second evaluating the submitted papers.

The Same Day: I Will Be Rejected for Sure!

I submitted my fake article to the *International Journal of Social Science and Humanities Research* (IJSSHR) using a fake name (Ahmed Mousa) and fake institution and waited. I expected that my paper would be considered and accepted/rejected after "five to ten days."

My paper contained seriously fatal scientific flaws such as sampling errors, mathematically incorrect tables, uncited

important data, and poor English. For example, in the abstract section the total sample was "700 undergraduate students" and the prevalence of X disease was "55.8%," but in the methods and result sections, the total sample was "800" and "500," and the prevalence of X disease was "25.8%." As another example, in the ethical consideration section, I wrote: "Ethical clearance has not been obtained from the X University Ethical Committee." In addition, I made simple grammatical mistakes such as "it are" and "they was," which cannot be discovered by merely looking at the manuscript. Not to mention the other academic mistakes such as not citing references of the used scales, not reporting significant associations, and using scales of very poor internal consistencies (i.e., Cronbach alpha = 0.12).

Day #2: Congratulations!

Surprisingly, despite all of those flaws, my paper was accepted the next day. I was shocked this time. My inbox contained an unread mail from Research Publish Journals <editor@researchpublish.org> with the subject line "Acceptance Letter." Was I hallucinating?

What kind of journal writes "Greetings!!!!!!" in an acceptance email? Is it an automatic message? I had published a research article before. I received a message that had more informative content, such as: Dear (my name), Your manuscript titled (the study title) has been accepted … Attached is the final draft of your article. With regards.

I did not receive any final draft of my article, so I sent them a message asking them for the final draft.

And they replied that they will send it to me before the publication. When? Apparently after they receive their $50 ASAP.

My Message to You

"Most people don't know the journal universe. They will not know from a journal's title if it is for real or not."—Dr. Steven Goodman, a dean and professor of medicine at Stanford and the editor of the journal *Clinical Trials*

From: Research Publish Journals <editor@researchpublish.org>
Sent: 13 May 2017 12:04
To: [redacted]
Subject: Acceptance Letter

Dear Author, Greetings!!!!!!

Your manuscript has been **accepted** for publication in current issue of IJSSHR

Track Id	723b43
Author Name	Ramzi Ahmed Mousa
Paper Title	Social phobia among undergraduate students: prevalence and associated factors.
Email	[redacted]
Journal Name	IJSSHR
Status	Accepted

Please deposit **publication fee and** scanned copy of filled (By using pen) **copyright form** for further processing of your paper as soon as possible. The manuscript will be published on the next working day after payment of a fee and submission of scanned copyright form. Copyright form attached with this email.

Science is a great way to understand the world around us, to understand ourselves, and to understand others. Scientific papers are the language of science. Internet databases have a lot of good (and bad) published papers. There are papers designed to solve difficult problems in medicine, physics, and numerous other fields, and there are papers that are written just to be published somewhere without any real contribution to the growing scientific literature.

If you are an author, please try to avoid journals that treat you like prey and do not respect your hard and time-consuming work. It is not paramount to get published as soon as possible. A good study must be reviewed by unbiased reviewers whose only goal is to tell you whether your paper is publishable or not. Getting published in a predatory journal may add some points to your CV, but it will affect your future career as an academic researcher and put you among fake researchers who contribute to the problem. So please try to publish in a real and reputable journal, even at the expense of your time and money.

If you are a reader, you might not be aware of a lot of fake journals that look like real ones in everything, including the website design, language style, paper format, and "PhD" editors and contributors. Not every PDF file that has a large reference list is a scientific paper, so always be a suspicious reader. Well-regarded journals will be indexed in well-known libraries like PLoS and PubMed (Kolata 2013). ■

Note

I do not have commercial or any conflicts of interest with Research Publish Journals. One may wonder why I chose this journal among thousands of questionable publications on Beall's list or other lists. The reason I reported my experience with this particular journal is that I knew that many of my colleagues and medical students in my country submit their well-written papers to them, just to pay less and get published in a short time.

References

Beall, J. 2012. Predatory publishers are corrupting open access. *Nature* 489: 179 (September 13). doi:10.1038/489179a.

———. 2017. Bealls's List of Predatory Journals and Publishers. Available online at http://beallslist.weebly.com; accessed June 16, 2017.

Bohannon, J. 2013. Who's afraid of peer review? *Science* 342 (October 4): 60–65.

Clark, J, and R. Smith. 2015. Firm action needed on predatory journals. *BMJ* 350: h210 (January). doi: 10.1136/bmj.h210.

Kolata G. 2013. Scientific articles accepted (personal checks, too). *New York Times* (April 7): 6–9.

Sorokowski, P., E. Kulczycki, A. Sorokowska, et al. 2017. Predatory journals recruit fake editor. *Nature* 543 (March 23): 481–482. doi:10.1038/543481a.

Truth, F. 2012. Pay big to publish fast: Academic journal rackets. *Journal of Critical Educational Studies* 10 (Stratford): 54–105.

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THE POLITICIZATION of Scientific Issues

Looking through Galileo's Lens or through the Imaginary Looking Glass

It is paradoxical that in populations supportive of science and democracy scientific issues have become politicized to the degree that objective evidence is ignored or rejected in favor of "alternative" opinions.

JEANNE GOLDBERG

"My dear Kepler, what would you say of the learned here, who, replete with the pertinacity of the asp, have steadfastly refused to cast a glance through the telescope? What shall we make of this? Shall we laugh, or shall we cry?"

These words of Galileo, written in a letter to his friend Johannes Kepler, expressed his frustration related to the fact that evidence clearly supportive of heliocentrism was not respected and was in fact rejected as being heretical, in direct opposition to biblical scripture. Galileo was hopeful that if people who believed in the ancient theory of geocentrism would, to paraphrase him, "just look through the lens" of his telescope, they would see evidence to support the theory of heliocentrism (in which the Earth and its planets revolve around the Sun), first contemplated in Hellenistic times and then later supported by Polish astronomer Nicolaus Copernicus's work *On the Revolutions of the Celestial Orbs*, published in 1543.

Aristotle's work in physics and astronomy was largely respected among astronomers at the time Copernicus's book was published, and they had difficulty accepting Copernicus's work. In addition, biblical views were prevalent among the population. Galileo was well aware of this fact but stated that "the Bible is written in the language of the common person who is not an expert in astronomy." He argued that "Scripture teaches us how to go to heaven, not how the heavens go" (Van Helden 1995). His discoveries, published in 1632 in *Dialogue Concerning the Two Chief World Systems*, and those of Kepler further supported the scientific foundation of Copernicus's work, ensuring that most serious astronomers subsequently were Copernicans.

Galileo's book, however, was incendiary by espousing a worldview that contradicted one long accepted. There are striking similarities of Galileo's world with ours today in the twenty-first century. Since his time, however, scientific research has furthered our understanding of the world and led to advances that have transformed the lives of billions of global citizens.

Why, then, have partisan politics permeated the discussions and decisions related to science-based issues such as climate change, evolution, vaccination, GMO technology, stem cell research, and other topics not only here in the United States but globally? Is a lack of understanding, disinterest, or ignorance of scientific facts to blame? Is scientific literacy and research not prioritized in our nation? What threats to people's lives are posed by accepting—or at least considering—scientific evidence? If citizens would "just look through" (Galileo's) telescope rather than the proverbial looking glass, would they understand the importance of science for themselves and be more accepting of the findings of scientific experts?

It is illuminating to step back in history again and consider the important role that philosophy played in the ancient world. Philosophy, the study of the fundamental nature of knowledge, reality, and existence, is regarded as a distinct academic subject today. Philosophy in the ancient world, however, represented the discipline of studying the natural world in a rational way, as a variety of scientific disciplines do today. Science and philosophy, considered to be such distinctly different disciplines today, were in effect one branch of knowledge in the ancient world.

Consider the poem that Lucretius wrote in 50 BCE, "On the Nature of Things." In *The Swerve: How the World Became Modern*, Stephen Greenblatt (2011) tells a fascinating story about a papal secretary who, in the Middle Ages, traipsed across Europe in search of a copy of this reportedly lost poem. The story of the adventures of this secretary is in itself intriguing, but the actual poem was earthshaking in its time and, interestingly, still is today!

Lucretius's poem portrayed religions as cruel and superstitious, fueled by ignorance and fear. In his poem, he proposed a scientific world vision in which all things, animate and inanimate, are composed of invisible particles, moving randomly and continuously in a void. There is no creator; living things have come into existence over eternity by random collisions of the particles and have evolved by a process of trial and error. Their purpose is only to survive, reproduce, and participate in a life of pleasure. Humans are not at the top privileged level of existence, and by understanding their own insignificance and the fact that there is no afterlife they will appreciate the wonder of life and be filled with pleasure (Greenblatt 2011, 185–201). The poem, which addressed Lucretius's natural ("scientific") worldview, was regarded as subversive and heretical, and those who openly supported it risked their lives. In fact, in 1600, the Roman Catholic Church Inquisition questioned Giordano Bruno, a defrocked Dominican monk, Italian philosopher, and scientist, and then burned him at the stake for openly supporting the views expressed by Lucretius in "On the Nature of Things."

The fusion of science and philosophy was also a cultural feature of pre–Revolutionary Era America, reflecting the values of The Enlightenment in Europe. In *Anti-Intellectualism in American Life*, Richard Hofstadter describes the fact that the early American Puritans, although criticized for serious, cruel actions, "came as close to being … a class of intellectuals intimately associated with a ruling power … as America has ever had" (Hofstadter 1962, 59).

A respect for science continued into the Revolutionary Era as the American Founding Fathers demonstrated their support of science and reason. Although Christianity was an important cultural feature of U.S. history, they embraced the secular values of Christianity in preference to its dogma. There is a plethora of quotations to support this fact. *In Poor Richard's Almanack*, Benjamin Franklin stated that "The way to see by faith is to shut the eye of reason." Thomas Paine wrote, "To argue with a man who has renounced the use and authority of reason, and whose philosophy consists in holding humanity in contempt, is like administering medicine to the dead" (Paine 1778). (Interestingly, George Washington, John Adams, James Madison, and Thomas Jefferson were citizen scientists who found, to quote Thomas Jefferson, "supreme delight" in pursuing scientific topics by conducting their own experiments.)

Anti-science views have been amplified by the political wave of populism that is sweeping not only America but also Europe.

In a broader sense, the Founding Fathers understood the synergistic relationship of science and democracy. They transported the scientific method of testing of hypotheses and ideas, peer review, and free speech without fear of retaliation into a governmental context. John Adams referred to the "science of government" and applied the relationship of the scientific principle of equilibrium to the system of checks and balances, a critical component of democracy. The Founding Fathers also recognized the potential of scientific knowledge to solve problems and improve the lives of Americans in the future (Union of Concerned Scientists 2017).

The years following the Revolutionary Era in our country, however, marked an abrupt departure from the rational, secular orientation of the Founders. A current of anti-intellectualism, described in Richard Hofstadter's brilliant book *Anti-Intellectualism in American Life* (Hofstadter 1962), grew progressively stronger during the early nineteenth century, changing the public's attitudes toward science and other scholarly subjects. Hofstadter describes the early nineteenth century westward migration of the U.S. population away from the cultural centers in coastal New England as a critical factor in the development of anti-intellectualism. An upsurge of revivalistic religious sentiment accompanied this migration too, with a demand for preachers who could deliver emotional appeals to the uneducated lay people in the frontier regions. Dwight L. Moody, a prominent evangelist of the period, scorned reading books and described learning as "an encumbrance to the man of spirit." His scorn for science was widely shared among the public, amplified when he stated that students were taught that man was the "offspring of a monkey" (Hofstadter 1962).

As science became more complex and differentiated, the common man began to feel dependent upon "experts," many of whom were located in coastal eastern urban areas. Individuals' treasured feelings of self-sufficiency and independence were compromised, leading to resentment. Americans respected intelligence but not intellectuals, and they complained that the value of an idea was governed by its utility—it had no value in itself. This belief pervaded the business world as well, creating Americans' strong admiration for a self-made man, one whose path led to economic and social success without much education, often in spite of it.

So what has happened in our country? How have issues with scientific implications become politicized and analyzed through partisan rather than objective lenses? How can political candidates gain public support by professing views that contradict objective scientific evidence?

It is a paradox that in a nation that has been in the forefront of scientific developments, climate change was mentioned as an important issue by only one candidate, Bernie Sanders, in the 2016 presidential campaign. No questions related to climate change were posed by moderators in the televised debates. It is also

remarkable that in the current 115th Congress, there are 222 members with law degrees while there are fourteen physicians. There is only one PhD scientist, Representative Bill Foster, who has a PhD in physics. Eighteen members of the House have no degree beyond their high school diploma (Manning 2017).

The War on Science by Shawn Otto is an authoritative new source of information concerning the questions raised in this article. He makes the point that "knowledge is power, and power is political" (Otto 2016). In view of its dynamic, ever-changing knowledge base, science may threaten vested interests and conflict with fixed worldviews, including those based on superstition and religion.

Another interesting paradox that Otto points out, however, is that the scientific method is inherently democratic since one's hypotheses and results are subject to evaluation and testing by other independent sources; nevertheless, the public often regards scientists as authoritarian, arrogant elitists (Otto 2016). Scientists in our country admittedly have often retreated to the laboratories and haven't actively engaged with the public, with the exception of a few stellar individuals such as Neil deGrasse Tyson, E.O. Wilson, Rachel Carson, and Carl Sagan. These scientists have performed an excellent service by making complex scientific issues understandable and interesting to the public. Unfortunately, their work is often undermined by the public's feelings of envy and alienation.

Anti-science views have been amplified by the political wave of populism that is sweeping not only America but also Europe. Key elements of populism are anti-elitism and nativism, which can translate into anti-immigrant views (Toker 2016). The role of globalization in the creation of not only economic but also knowledge inequality has amplified these feelings of resentment.

A critical driver of the politicization of science is the perception of threat to religious beliefs, and the school choice issue brings this into sharp focus. For example, many evangelicals feel that tax-supported vouchers should be used to promote anti-science religious dogmas such as creationism. Indeed, the recently appointed Education Secretary Betsy DeVos stated several years ago that one of the goals of our schools should be "to confront the culture in ways that will continue to advance God's kingdom" (Rizga 2017). Evangelicals feel threatened by evolution, now universally accepted by the scientific community. Interestingly, 81 percent of self-identified white, born-again evangelicals voted for the Republican presidential candidate Donald Trump in the 2016 presidential election, while only 16 percent voted for the Democrat Hillary Clinton (Smith and Martinez 2016).

In addition to posing a threat to one's religious beliefs, some individuals perceive scientific research as a threat to their business interests. This is especially true if the research results in governmental regulatory policies that are perceived to harm profits. Climate change is an obvious example of this dynamic. Shawn Otto points to the example of Exxon, which in the 1970s promoted climate science only to take the opposite stance as a climate denier in recent times (Otto 2016). The Republican Party, traditionally the party representing business interests, formulated a platform in the 2016 presidential election that supported cuts to scientific research, halting of funding for the U.N.'s Framework Convention on Climate Change, cancellation of the Clean Power Plan, and other deregulatory actions. The Trump Administration appointment to Secretary of the Environmental Protection Agency is an individual who has sued that very agency many times to weaken its environmental regulations and would like to see its power severely reduced.

Science may threaten vested interests and conflict with fixed worldviews, including those based on superstition and religion.

Another facet of the politicization of science in our country is the effect of the postmodernism movement, which occurred in the latter part of the twentieth century. This movement represents a distrust of the Enlightenment principle of rationality. Although the term *postmodernism* has traditionally been applied to the humanities, it has broad implications for attitudes toward science, promoting the idea that truth is contextual, depending on one's culture, education, and life experiences. This attitude is

misplaced when dealing with scientific facts such as evolution. Otto further describes the role of journalists in promoting the "other side" of disagreements regarding scientific issues, even when the weight of evidence overwhelmingly supports one conclusion. This mistakenly gives opinion the same weight as fact (Otto 2016).

One of the unfortunate results of postmodernism is that individuals see scientific issues in ways that fit their preconceptions and make them comfortable. As individuals mature, they may gravitate toward the political party whose views they share on other nonscientific issues and then proceed to adopt unquestionably, almost in a tribal fashion, the views of that party on scientific issues. The public's gravitation to biased television reporting, social media, and Internet resources that fit their worldview as sources of information on scientific issues further calcifies their opinions.

Unfortunately, the public's respect for scientific developments can be modulated by fear. Progressive Democrats have traditionally been strong supporters of scientific research and have endorsed the validity of evolution and climate change; nevertheless, some regard GM foods, vaccination, fluoridation of drinking water, and a variety of chemicals as threatening developments. Even many scientifically literate progressives are skeptical about the safety of GM foods and are concerned that the food industry's vested interests may outweigh safety issues. Conservative Republicans, on the other hand, may or may not personally approve of GM foods, and business interests could override their safety concerns (Funk and Kennedy 2016).

The issue of vaccination is complex, involving strange bedfellows. This debate arose in recent times as a result of a *Lancet* medical journal article that contained fraudulent information indicating that autism could result from vaccination (General Medical Council 2010). Some progressive Democrats, usually supportive of regulations that they see as contributing to public welfare, object to vaccination on the (faulty) grounds that it may result in autism. Some conservatives, mainly Republicans, object to it because they feel that their personal freedom is threatened by school requirements for vaccination.

Another issue with strange bedfellows is food supplements. In his illuminating book *Do You Believe in Magic?*, Paul A. Offit outlines the steps by which Congressional members from both the Democrat and Republican parties enacted legislation in 1976 that effectively freed the entire supplement industry from the FDA requirement that products had to be shown to be both safe and effective. Later attempts to pass legislation requiring supplements to meet FDA requirements were made primarily by Democratic legislators but were defeated by Republicans who had political constituencies or personal financial investments in the industry (Offit 2013).

In *The War on Science*, Shawn Otto describes the "marriages" between different segments of our society, which by sharing common agendas became the two major modern political parties in our country. These marriages are as follows:

(1) The anti-regulatory, pro-corporate business interests and the anti–reproductive-control religious interests found their representation in the Republican Party.
(2) The pro-environment, pro-choice, anti-corporate elements of scientists and environmentalists found their interests best represented in the Democratic Party.

The scientific method is inherently democratic since one's hypotheses and results are subject to evaluation and testing; nevertheless, the public often regards scientists as authoritarian, arrogant elitists.

These marriages have catalyzed the extreme polarization regarding scientific issues that we witness today. In the current parlance, this is "identity politics" (Otto 2016).

It is beyond the scope of this article to propose potential solutions to this situation. Shawn Otto, however, has articulated a comprehensive strategy in his book to raise the awareness of the importance of science in our democracy. Scientists, teachers, and businessmen can engage in public outreach, and candidates running for public office must demonstrate their knowledge of and commitment to science in public debates. Otto lists ways in which concerned citizens can become effective activists and offers an exhaustive list of organizations that are engaged in this effort (Otto 2016). The hundreds of thousands of citizens in the United States and across the globe who participated in the March for Science on April 22, 2017, sent a strong, clear message to world leaders and to other citizens that science plays a vital role in our lives and is ignored only at our peril. After all, it's difficult to name any issue that isn't either directly or indirectly related to science!

An increasing number of businesses are endorsing policies and positions that are fact-based. Jeffrey Immelt, the CEO of GE, for example, stated recently, "We believe climate change is real and the science is well accepted. We hope that the United States continues to play a constructive role in furthering solutions to these challenges" (*Wall Street Journal* Business section, March 30, 2017).

As one of many nations that are intensely focused on the welfare of children and grandchildren, an emphasis on personal, corporate, and governmental responsibility could be powerful and universally appealing. Although a rational approach to scientific issues is essential, emotional appeals regarding specific issues incorporating the message "for the children's sake" might incentivize people with differing views and orientations to work together on controversial issues. Imagine the power of this approach with regard to environmental preservation, for example. A video could be produced showing a child enjoying a bird's song today in 2017 but not in 2050 because of environmental destruction. Or consider the alternative, a video of the child looking and listening to the same bird in 2050 as a result of environmentally responsible actions! This child-centered approach has been woefully underutilized.

In conclusion, there is no doubt that a threat to our democracy exists when there is scientific illiteracy, complacency, or extreme polarization regarding scientific issues among the general public. This is fertile ground for powerful vested interests to use baseless "information" (i.e., "fake news") to lobby for their positions on issues that threaten or support their views. This constitutes a form of authoritarianism that can be used to impede scientific progress and, in the long run, cause a government to fail. We have only to look at examples where that has occurred (e.g., China during the Cultural Revolution, Nazi Germany, and the Ottoman and Roman Empires) to see the catastrophic results. We must "look through Galileo's lens" rather than through an imaginary looking glass and respect the power of science to preserve our democracy in the United States and globally. ■

References

Funk, Cary, and Brian Kennedy. 2016. The new food fights: U.S. public divides over food science. Pew Research Center (December). Available online at http://www.pewinternet.org/2016/12/01/the-new-food-fights/.

General Medical Council. 2010. Andrew Wakefield: Determination of serious professional misconduct. Available online at http://www.bmj.com/content/342/bmj.c7452.

Greenblatt, Stephen. 2011. *The Swerve: How the World Became Modern*. New York and London: W.W. Norton and Company.

Hofstadter, Richard. 1962. *Anti-intellectualism in American Life*. New York: Vintage Books, a Division of Random House.

Manning, Jennifer E. 2017. Membership of the 115th Congress: A Profile. Congressional Research Service 7-5700. Available online at www.crs.gov.

Offit, Paul A. 2013. *Do You Believe in Magic?* New York: HarperCollins Publishers.

Otto, Shawn. 2016. *The War on Science*. Minneapolis: Milkweed Editions.

Paine, Thomas. 1778. The American Crisis: Lancaster, March 21, 1778. The Crisis.

Rizga, Kristina. 2017. Betsy DeVos wants to use America's schools to build "God's kingdom." *Mother Jones* (March/April). Available online at www.motherjones.com/politics/2017/01/betsy-devos-christian-schools-vouchers-charter-education-secretary.

Smith, Gregory A., and Jessica Martinez. 2016. How the faithful voted: A preliminary 2016 analysis. Pew Research Center (November 9). Available online at http://www.pewresearch.org/fact-tank/2016/11/09/how-the-faithful-voted-a-preliminary-2016-analysis/.

Toker, Daniel. 2016. Is populism a threat to science? *The Humanist* (August). Available online at https://thehumanist.com/news/science/populism-threat-science.

Union of Concerned Scientists. 2017. Science and Democracy in the United States: A Rich History. Available online at http://www.ucsusa.org/center-for-science-and-democracy/science-and-democracy-in-the-US-history-html#.WJjE37GZOuU.

Van Helden, Al. 1995. Copernican system. The Galileo Project. Available online at http://galileo.rice.edu/sci/theories/copernican_system.html.

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The Fakery of Electrodermal Screening

Souped-up galvanometers are being used to assess people's health and determine what they supposedly need. Tests expose them as preposterous, and government agencies should stop their use.

STEPHEN BARRETT

The use of galvanometric devices to make health assessments is commonly referred to as electrodermal screening (EDS) or electroacupuncture according to Voll (EAV). Last year, I tested myself with a leading EDS device forty-three times in ten days and found that the results were preposterous. In addition to my experience, this article describes the history of EDS devices and why I believe they should be banned.

Background History

Electrodermal screening devices are said to measure and react to skin resistance to the passage of low-level electrical current. At least forty have been marketed during the past sixty years. Proponents attribute their origin to Reinhold Voll, a West German physician/acupuncturist who asserted that skin resistance is related to the health of the body's internal organs. In 1958, he combined Chinese acupuncture theory with galvanic skin response measurements to determine what he said was the body's flow of "electro-magnetic energy" along "acupuncture meridians" (Barrett 2016a).

Voll's first transistorized model—the Dermatron—was a box with two gauges, several dials, and wired components that would be placed in contact with the patient's skin. The device emitted a tiny direct current that flowed through a wire to a metallic cylinder that the patient held in one hand. Another wire went from the device to a probe that the operator touched to supposed "acupuncture points" on the patient's other hand or a foot.

The Dermatron measured the electrical resistance of the patient's skin at each point touched by the probe and displayed it on a gauge as a number from 0 to 100. Voll declared that readings from 45 to 55 were normal ("balanced"), readings above 55 indicated inflammation of the organ "associated" with the meridian being tested, and readings below 45 suggested "organ stagnation and degeneration." Homeopathic products would be administered and the patient retested until everything was determined to be "balanced." Other early devices, such as the Vegatest, added a honeycomb into which vials of remedies could be placed to test whether their contents would supply the hoped-for balance.

Subsequent EAV devices replaced the gauge with a computer that reflected the measurements on its screen, reported what organs might be affected, suggested what products might be most useful, and added dietary supplements and herbal preparations to the recommended product mix. Some systems, most notably the INTERRO, used a dedicated computer, whereas others provided software that would run on a standard computer.

As these evolved, the products being tested in vials were replaced by computer codes said to represent the products, and software was programmed to display elaborate charts, pictures, and lists of body areas, symptoms, diseases, and supposedly corrective measures. Most recent systems don't use a probe but have the patient continuously connected through one or more components that serve as electrodes. ZYTO devices use a hand cradle that plugs into a computer. The iTOVi Nutrition Tracker uses a hand-held scanner that plugs into a smartphone loaded with an app that generates recommendations (Barrett 2017a).

I stumbled onto the fakery of these devices during an investigation of homeopathy for *Consumer Reports* magazine. In 1986, after testing me with an INTERRO device, the clinic proprietor said I had a number of electromagnetic blockages plus "temporomandibular joint stress, probable subclinical allergies, and possible mild early preclinical arthritis" (Barrett 1987). During the testing, I noticed that the harder the probe was pressed against my skin, the higher the reading on the computer screen—which is not surprising, because pressure reduces electrical resistance and makes the current flow better

from the probe to the skin. A few years later, I learned that placing products into the honeycomb of a Vegatest device had no effect on its readings (Mosenkis 2001). This was no surprise because glass does not conduct electricity, so even if the products emitted electric signals, they could not escape from the vial.

The current market leader of EDS systems appears to be ZYTO Technologies of Lindon, Utah. Its users include chiropractors; naturopaths; acupuncturists; massage and colon therapists; "holistic" dentists; veterinarians; physicians who purport to practice "integrative" or "complementary" medicine; and unlicensed "nutritional consultants," "wellness consultants," "health coaches," and distributors for multilevel marketing companies that sell dietary supplements and/or herbal products.

ZYTO's Claims

According to the ZYTO website, "Just like a doctor uses a stethoscope to listen to a child's breathing, the ZYTO 'listens' to the body's subtle galvanic skin response" and suggests corrective measures (ZYTO 2017b).

To run the test, the hand cradle is connected to a USB port on the practitioner's computer, and the patient's hand is placed with palm and fingers touching corresponding metallic areas on the device. The practitioner then launches the software program and selects the type and scope of test from menus that appear on the computer screen. The software then generates numbers and graphics that supposedly indicate (a) whether the function of various organs and body parts are "in range" (favorable) or "out of range" (unfavorable) and (b) which products, procedures, and/or dietary measures show the most "coherent responses" (those that will bring the values "within range"). Changes in skin resistance are said to trigger what gets matched.

ZYTO says that its software sends "digital signatures" (unique code numbers) to the body and determines "the body's degree of preference" for measures that will make the body most "biologically coherent." To have their products considered during the test process, manufacturers submit them to the company, which creates a "library" of digital signatures for each product plus a brief description of what the product can do. "Libraries" are available for the offerings of more than 200 companies. ZYTO's software is also said to contain signatures that represent the condition of various organs, teeth, and spinal segments—all of which, the company claims, are connected through acupuncture meridians (ZYTO 2017a).

The stated goal of the test is to match the supposed characteristics of the patient to the products, services, and/or dietary advice that the practitioner can provide. The Internet-advertised prices of scans run from $10 to $250, but the recommended products often cost hundreds of dollars more. Testing can be done in the presence of the practitioner or done remotely though the Internet by connecting a purchased or borrowed hand cradle to the client's computer. Many practitioners aim to scan everyone who con-

The INTERRO. One probe is held in the patient's hand. As the other probe is touched to the patient's other hand or foot, a bar rises on the right side of the computer screen, accompanied by a noise. The reading supposedly determines the status of various organs of the body. After the alleged problems are "diagnosed," glass vials containing homeopathic solutions are placed in the metal honeycomb and the tests are repeated to determine which will correct the alleged "imbalances."

The ZYTO hand cradle

sults them. One provider in Virginia, who has no relevant license but offers remote testing throughout the world, states that he has done more than 20,000 scans.

Last year, I was able to access a ZYTO system (the Elite 5.0) and see whether repeated testing could produce consistent and meaningful results (Barrett 2017b). As far as I know, no similar study has ever been published.

My Test Results

Using myself as the subject, I ran three series of tests. The first was a basic scan that supposedly evaluated my internal organs. The other two were nutritional "biosurveys" to determine what I should or shouldn't eat.

The basic scan is said to determine whether "biomarkers" are in or out of range for twenty organs: adrenals, bladder, gallbladder, heart, hypothalamus gland, kidneys, large intestine, liver, lung, pancreas, parathyroid, pineal, pituitary, prostate, small intestine, spleen, stomach, testes, thymus, and thyroid. My basic scans generated reports that were eight to thirteen pages long. Shown below are portions of six pages from one of my reports. The findings for the organ biomarkers are displayed with a colorful full-page bar graph and as positive or negative numbers elsewhere in the reports.

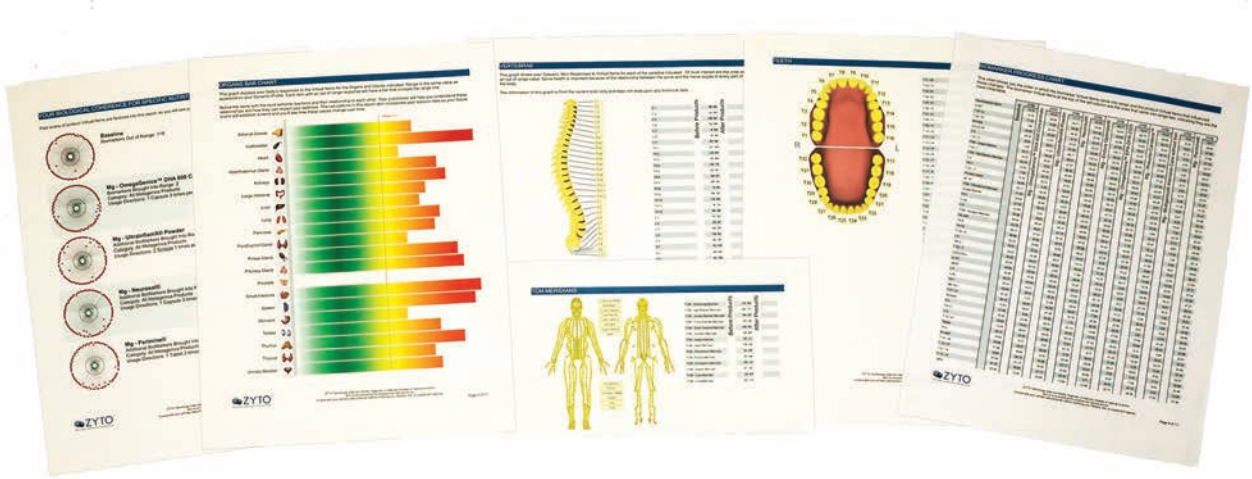
Table 1 shows the results of sixteen basic scans, with four done within an hour on each of four consecutive days. These scans found means of 69.2 biomarkers and 11.4 organs that were "out of range," but the organs specified and the supposedly corrective products—a mean of 5.3 per scan—varied considerably from one test to another. The organ with the highest "out-of-range" score, positive or negative, also differed from test to test. Four reports highlighted my adrenal glands; three chose my small intestine; two chose my heart; two chose my thymus; and the other six tests each identified a different, supposedly problematic, organ. Only four of the sixteen scans had *any* organs "within range."

Even though I have no gallbladder, this organ was reported to be positively "out of range" four times, negatively "out of range" four times, and "within range" eight times. I have benign prostatic hypertrophy, but my prostate did not show up in one scan and was reported to be positively out-of range in seven, negatively out of range in four, and within range in four.

ZYTO claims that its nutritional surveys can determine "which foods and supplements are right for you" (ZYTO 2016). The test reports can be configured to assess food categories, "top negative foods," and/or "all positive in-range foods." The food categories are additives, beans/legumes, beverages, dairy/egg, fat/oils, fish/seafood, fruits, grains, meats/poultry, miscellaneous, nuts/seeds, spices/seasonings, sugars/sweeteners, and vegetables.

To explore how the food biosurveys work, I conducted twelve food-category tests and fifteen individual-food assessments. The resultant reports were two to four pages long.

The food-category tests were completed within one hour. As shown in Table 2, the test reports recommended avoiding a mean of 6.4 categories per test, but not necessarily the same ones. Ten of these tests recommended avoiding grains, nine recommended avoiding nuts and seeds, and eight recom-



Selected pages from a ZYTO report

The colorful bar graph purports to show whether biomarkers for each of twenty organs are "out of range." The greater the supposed problem, the longer and redder the bar that crosses the vertical "range line" in the middle of the bar graph. Most scans have a bar for every organ, but this one failed to detect the author's adrenal glands, prostate, and testes. The other pages state which spinal segments, acupuncture meridians, or teeth have relevant problems and which products can correct the alleged problems.

Table 1. Summary of Basic Scan Results

Test Date	July 2, 2016				July 3, 2016				July 4, 2016				July 5, 2016			
"Range" Value	66	37	.01	.01	22	22	22	22	54	54	54	54	55	55	55	55
Adrenals	±47	70	-47	17	-142	±6	34	44	**107**		**107**	**143**	-82	69	**81**	-58
Bladder	±36	-52	64	-28	-168	±18		52		110		57	254			
Gallbladder	±48	-53	-20	**-51**	±0	±17			57	69	-60		164	74		
Heart	±30	±5	**92**	10	51	±18	-31	-34				-92	180	**125**		
Hypothalamus	86	53	-46	30	±6	±10	26	44				80	-120	116		-55
Kidneys	±42	52	-21	-35	-107	**-46**		26		85			139	57		
Large Int.	±48	±6	58	24	257	±18	-36	-58				120		-116	-58	
Liver	±65	**76**	51	20	±13	±6	44	37					-125	94		
Lung	±8	-67		-31	-131	-30		29		96		128	154		-78*	
Pancreas	±49	±9	35	28	113	±21	-37	-60						-108		
Parathyroid	89	60	48	12	79	23	**54**	27	-55		100	96	-115	110		
Pineal	±26	-48	49	39	-144	-35		27		111		129	175		-61	
Pituitary	±40	±6	17	43	177	±16		**-66**		-54		-66		-105		
Prostate	82	51	-51		104	±8	24	29	-63		62	-80	-116	103		
Small Int.	±47	-70	37	**-51**	-151	±17	-36	32		**117**		113	**283**	70		62
Spleen	83	±7	28	48	247		-39	-56		-60				-70	70	
Stomach	114	55	-73	-11	35	±8					58	-110	-100	94		
Testes	±8	-50	76	-28	-119	-27		34		101		121	210			
Thymus	±45	±11	10	41	**275**	±4		-58			-59			-111		**-63**
Thyroid	**135**	70	47	-25	±6	±10	24		-67		67	-99	-96	124	-66	
# of Biomarkers "out of range"	**57**	**74**	**119**	119	101	55	82	94	25	56	36	84	87	82	19	17
# of Organs "out of range"	**6**	**14**	**19**	19	16	5	11	17	5	9	7	14	15	16	6	4
# of Products	6	8	5	4	8	5	8	8	3	2	2	6	8	8	1	2

The numbers are said to represent the body's response to code numbers that represent the organs listed in column 1. The software determines a range (baseline) value, compares the response numbers with that value, determines whether "biomarkers" are within that range," and recommends products that supposedly will bring "out of range" biomarkers back "in range." ZYTO reports list the "out-of-range" numbers in a table. The numerical value of the "in range" numbers can be derived by measuring the bars in the bar graph, but their direction is not specified, so they are listed here as "±" numbers. The furthest out-of-range numbers (displayed here in bold-face type) are said to require the most attention. If a table cell is empty, no organ response was reported. All numbers are rounded to the nearest integer.

Table 2. Results from the Twelve Food-Category Biosurveys

Food category	Avoid	1	2	3	4	5	6	7	8	9	10	11	12
Additives	7	-11	-26	-36	-4	-23	19	21	-11	49	39		-18
Beans/Legumes	8	8	-35	-17	-35	-21	-43	28	-32	-33	79	8	-46
Beverages	4	6	38	33	30	28	-13	-71	72	7	-28	-107	
Dairy/Egg	6	-22	1	-20	-9	-14	51	58	-8	41	-36		-11
Fat/Oils	8	32	-30	-7	-33	-23	-44	-2	-26	-36	78	-79	-47
Fish/Seafood	3	9	33	41	43	45	-9	-56	48	5	-26	-118	
Fruits	8	-21	-10	-17	-5	-28	59	66	-31	38	-36		-21
Grains	10	19	-43	-34	-44	-27	-51	-22	-8	-46	78	-41	-60
Meats/Poultry	5	14	43	49	37	34	-11	-19	36	-5	-35	-89	
Misc.	6	-39	-7	-9	3	-16	73	53	-43	61	-57		-8
Nuts/Seeds	9	25	-45	-31	-26	-14	-52	-30	21	-50	84	-41	-57
Spices/Seasonings	5	-6	39	48	37	40	-6	-30	38	7	-22	-95	
Sugars/Sweeteners	3	-26	11	-14	4	-15	65	72	-29	46	-67		11
Vegetables	8	28	-27	-31	-37	-15	-39	-41	21	-57	77		-53

The numbers are said to quantify the body's response to code numbers that represent the listed food categories. The positive numbers are food categories that should be included in your diet. The negative numbers represent the "top negative foods" that should be avoided. The "Avoid" column is the number of times the "top negative" list included the group. All numbers are rounded to the nearest integer.

mended avoiding fruits and vegetables. Five recommended avoiding all fruits, vegetables, and grains. One recommended only sugars/sweeteners; one recommended only beans/legumes; and one recommended only beverages, fish/seafood, meats/poultry, and spices/seasonings.

The individual-food tests were done in two groups. First, there were ten tests that assessed common foods. Two days later, five tests assessed a larger food list. Both groups took less than an hour to complete. As with the basic scans, the individual-food scores were wildly inconsistent, with many foods scoring "positive" (recommended) on one test and "negative" (not recommended) on another administered a few minutes later. For example, pineapple and red potatoes were listed seven times among the top negative foods and three times among the most positive foods.

The claim that ZYTO scanning can provide clinically useful information is preposterous. To demonstrate that a device is capable of measuring something, it is necessary to validate its accuracy and consistency with repeated tests. My basic scan results were so inconsistent that they could not possibly be clinically meaningful. In addition to being inconsistent, my food-category biosurveys recommended excluding so many foods that the resultant diets could be extremely unhealthful. Statistic analysis using Cohen's *kappa* to compare the results to one another found that they did not differ significantly from random.

To demonstrate that a device can detect organ pathology, it is necessary to do controlled studies of people who have

that condition and people who do not. To demonstrate that administering a product or procedure can improve outcome, it is necessary to study whether people who are treated do better than similar people who are not. A Medline search for "ZYTO" in the title yields no relevant publication.

ZYTO Technologies has not explained how it can construct or validate its organ assessments or product libraries without any underlying clinical studies. Nor is there any logical reason to believe that skin resistance is related to organ health or what people should eat. But even if magical explanations were found, the ZYTO system's moment-to-moment variability would still render its findings useless.

Electrodermal screening tests are not only worthless but potentially harmful. In addition to money wasted on the test and useless products, the harm can include (a) needless worry about nonexistent medical problems suggested by the test reports, (b) the cost of medical care involved in seeking reassurance, (c) failure to seek appropriate medical care for real problems, and (d) the consequences of malnutrition due to excessive dietary restrictions.

Government Regulation

In 2011, ZYTO Technologies obtained 510(k) clearance from the FDA to market its hand cradle as a galvanic skin response measurement device (Eydelman 2011). *Clearance* merely requires "substantial equivalence" to a device that was previously cleared or approved. It is not the same thing as *approval*, which requires that clinical trials demonstrate safety and efficacy for its intended purpose.

Because moistness of the skin affects its ability to conduct an electrical current, a few galvanic skin resistance devices have legitimate medical use in managing sweat-gland disorders. Aside from this, however, skin resistance has no proven or logical relationship to the diagnosis or management of any medical problem. ZYTO's 510(k) application and software registration did not indicate that the device would be used for diagnostic purposes.

ZYTO's marketing materials state that its devices are "not intended to be used in the diagnosis, cure, treatment, mitigation, or prevention of any disease or medical condition." However, "intended use" is based on the context in which a device is used and is not necessarily changed by the use of disclaimers or contrived terminology.

In 2015, the FDA warned ZYTO Technologies Inc. that "the promotion of the ZYTO Hand Cradle for use in diagnosing a disease or condition, predicting biological responses to a wide range of virtual stimuli including drugs and nutritional supplements . . . fall outside of the device's cleared intended use to measure galvanic skin response and constitutes a major change or modification to the device's intended use." The FDA also objected to the claim that "ZYTO's technology measures your body's responses to a specific library of nutritional products, asking your body which it prefers" (Mitchell 2015).

In 2016, presumably as a result of FDA pressure, ZYTO Technologies announced a voluntary recall of 1,252 ZYTO Select and Elite software programs due to "claims exceeding the 510(k) clearance" (FDA 2016). ZYTO has modified some of its marketing language, but there is no reason to believe this will influence how practitioners use its devices.

Marketers of the iTOVi Nutrition Tracker state that it is a "general wellness device" that does not require FDA clearance or approval. Some of its claims are similar to the language used by ZYTO to which the FDA objected, but whether the FDA will do anything about the iTOVi remains to be seen. The use of EDS devices by practitioners is subject to regulation by the states. Some states have taken disciplinary action, but there has been no systematic effort to discourage EDS use (Barrett 2016b).

There is no scientific evidence or logical reason to believe that galvanic skin response testing can determine a person's health status or strategies for health improvement. I believe that all such devices and associated software that are used for these purposes should be removed from the marketplace. ■

References

Barrett, S. 1987. My visit to the Nevada Clinic. *Nutrition Forum* 4: 6–8. Available online at http://www.homeowatch.org/articles/nevada.html.

———. 2016a. Quack electrodiagnostic devices. Quackwatch (June 4). Available online at http://www.quackwatch.org/01QuackeryRelatedTopics/electro.html.

———. 2016b. Regulatory actions related to EAV devices. Quackwatch (July 11). Available online at https://www.quackwatch.org/02ConsumerProtection/eav.html.

———. 2017a. iTOVi scanning: Another test to avoid. Device Watch (March 7). Available online at http://www.devicewatch.org/reports/itovi/overview.shtml.

———. 2017b. Close examination of a ZYTO electrodermal screening system. *Missouri Medicine* July/August (in press).

Eydelman, M.B. 2011. Letter to Vaughn Cook re 510(k) number K111308. August 30. Available online at https://www.accessdata.fda.gov/cdrh_docs/pdf11/K111308.pdf.

FDA. 2016. Class 2 device recall: ZYTO Select software and ZYTO Elite software. FDA website (July 1). Available online at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfRES/res.cfm?id=147046.

Mitchell, L.M. 2015. Warning letter to Vaughn R. Cook, May 8. Available online at http://www.fda.gov/ICECI/EnforcementActions/WarningLetters/ucm446687.htm.

Mosenkis, R. 2001. Examination of a Vegatest device. Quackwatch (September 4). Available online at http://www.quackwatch.org/01QuackeryRelatedTopics/Tests/vegatest.html.

ZYTO Technologies. 2016. Which foods and supplements are right for you? (August 25). Available online at http://zyto.blob.core.windows.net/zytosite/en/pdf/food_and_supplements_infographic.pdf.

———. 2017a. Vectoring your health with Dr. Cook. YouTube (February 17). Available online at https://www.youtube.com/watch?v=94B-zwSlfzuE.

———. 2017b. Understanding ZYTO reports. Available online at https://www.zyto.com/learning/understandingzytoreports/; accessed March 20, 2017.

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THE FALLACY FORK

Why It's Time to Get Rid of Fallacy Theory

Fallacy theory is popular among skeptics, but it is in serious trouble. Every fallacy in the traditional taxonomy runs into a destructive dilemma that I call the "Fallacy Fork": either it hardly ever occurs in real life, or it is not actually fallacious.

MAARTEN BOUDRY

Why do people believe weird things? Why is there so much irrationality in the world? Here's one common answer from the skeptic's playbook: fallacies. Fallacies are certain types of arguments that are common, attractive, persistent, and dead wrong. Because people keep committing fallacies, so the story goes, they end up believing all sorts of weird things.

In popular books about skepticism and in the pages of skeptical magazines such as this one, one commonly finds a concise treatment of the most common types of fallacies. The traditional classifications are widely known, often by their Latin names: *ad hominem*, *ad ignorantiam*, *ad populum*, begging the question, *post hoc ergo propter hoc*. Some of them are more obscure, such as *ignoratio elenchi*, affirming the consequent, *secundum quid*, and *ad verecundiam*, better known as "argument from authority." Most of them date back to the days of Aristotle; others are relative newbies, such as the slippery slope fallacy, the genetic fallacy or—for obvious reasons—the *reductio ad Hitlerum*.

Such lists serve a pedagogical purpose. By learning the most common types of reasoning errors, you will help avoid making them yourself and become better at spotting them when others do. It's a kind of inoculation against irrationality. If only people would learn the list of fallacies, the world would be a far more rational place!

Except this neat little story is wrong.

Skeptical about Fallacies

I used to teach a course in critical thinking at Ghent University. As behooves a good skeptic, I first presented my students with the usual laundry list of fallacies, after which I invited them to put the theory into practice. Take a popular piece from the newspaper or watch a political debate and try to spot the fallacies.

I no longer give that assignment. My students became paranoid! They began to see fallacies *everywhere*. Rather than dealing with the substance of an argument, they just carelessly threw around labels and cried "fallacy!" at every turn. But none of the alleged "fallacies" they spotted survived a close inspection.

Were my students to blame? I had to confess that when I did the exercise myself and looked for clear-cut fallacies in real life, I came away mostly empty-handed. Perhaps because my students didn't find any clear instances of fallacies, they started to make them up? So I turned to the classics. *The Demon-Haunted World* (1996) by Carl Sagan, perhaps the most celebrated work in the skeptical library, has a special section on reasoning fallacies, like many other books in the genre. But although Sagan duly lists all the usual suspects, he never puts them to work in the rest of the book. His treatment comes across as perfunctory, and he hardly gives any examples from real-life pseudoscience. Like many other skeptics, Sagan just invents some toy examples, which are easy to knock down but don't actually correspond to real-life arguments. It seems that Sagan is paying lip service to fallacy theory but has no use for it in his actual debunking work.

But if real life abounds with fallacies, why do skeptics such as Sagan have to invent toy examples to make their point?

Fallacy Fork

For a long time philosophers and argumentation theorists have tried to define the different types of fallacies, mostly by using some (semi-)formal argumentation schemes. The attractive idea behind such an approach is that it would allow for swift and easy identification of common reasoning errors, in a wide range of contexts. But alas, the hopes of fallacy theorists have been frustrated. Definitions and schemas have become more complex and unwieldy over time, making them less fit for practical use. Yet in spite of this, most authors continue to hold on to the notion that you can identify good and fallacious arguments based on their formal structure. The trick is just to find the right analysis.

I've now come to believe that this whole idea should be thrown overboard. Together with my colleagues Fabio Paglieri (an argumentation theorist) and Massimo Pigliucci (a dyed-in-the-wool skeptic), we recently published a paper in the journal *Argumentation* (2015) in which we explain what we think is wrong with fallacy theory. Not just with a particular definition of a given fallacy but with *all of them*. Here's the nub of the problem: arguments that are deemed fallacious according to the standard approach are always closely related to arguments that, in many contexts, are perfectly reasonable. Formally, the good and bad ones are indistinguishable, and no argumentation scheme can succeed in capturing the difference, separating the wheat from the chaff.

In our paper, we develop a destructive dilemma for fallacy theorists that we call the "Fallacy Fork." In this dilemma, fallacy theorists are forced to choose between two options, neither of which is appealing. Take any fallacy from the list. Now we have two options:

(1) We characterize our fallacy by means of a deductive argumentation schema. For instance, in the case of *post hoc ergo propter hoc*, we use the following definition: "If B follows A, then A is the cause of B." For a deductive argument to be valid, the conclusion needs to follow inexorably from the premises. In this case, that is clearly not true. By the standards of deductive logic, any argument instantiating that schema is fallacious. Now the good thing about this approach is that it

has normative force. There's no negotiating with deductive logic. The problem, however, is that we hardly ever find such clear-cut errors, presented in deductive form, in real life (see further). This is the first prong of the Fallacy Fork.

(2) We characterize our fallacy in a way that captures real-life arguments. In order to do so, we need to abandon our strict deductive approach. We need to relax our definitions and add some qualifiers and nuances. For *post hoc ergo propter hoc*, this might go as follows: "If B follows shortly after A, and we can think of a plausible causal mechanism linking A and B, then A is probably the cause of B." This definition is a bit more cumbersome, but it is much closer to the kind of arguments people make in real life. By casting our net wider, we catch many more fish. But now we have another problem on our hands: Is our argument still fallacious? In other words, is every instantiation of the argument wrong?

Let's see how the most famous fallacies fare when confronted with the Fallacy Fork.

As Randall Munroe (the creator of the web comic *xkcd*) once put it: "Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there.'"

Post hoc ergo propter hoc

Every skeptic is familiar with the dictum *correlation does not imply causation*. To think otherwise is to commit the *post hoc ergo propter hoc* (or *cum hoc*) fallacy. The website Spurious Correlations has collected some outrageous examples, with fancy graphs: there is a clear correlation between margarine consumption and divorce rates, and between the number of people who drowned by falling in a pool and the number of films featuring Nicolas Cage (per year). Is there a mysterious causal relationship between these events? If I was ill yesterday and feel better today, to which of the myriad possible earlier events should I attribute my improved condition? That I had cornflakes for breakfast? That I watched a movie with Nicolas Cage? That I was wearing my blue socks? That my next-door neighbor was wearing blue socks?

Not even the most superstitious person believes that correlation *automatically* implies causation or that any succession of two events A and B implies that A caused B. There are just too many things going on in the world and not enough causal connections to account for them. In its clear-cut deductive guise, the *post hoc ergo propter hoc* inference is a fallacy, to be sure, but hardly anyone makes it in real life. This is the first prong of the Fallacy Fork. So what about the kind of *post hoc* arguments that people *do* use in real life? As it turns out, many of those are not obviously mistaken. It all depends on the context (Pinto 1995).

Imagine you eat some mushrooms you picked in the forest. Half an hour later you feel nauseated, so you put two and two together: "Ugh. That must have been the mushrooms." Are you committing a fallacy? Not as long as your inference is merely inductive and probabilistic. Intuitively, your inference depends on the following reasonable assumptions: 1) some mushrooms are toxic, 2) it's easy for a layperson like you to mistake a poisonous mushroom for an edible one, 3) nausea is a typical symptom of food intoxication, and 4) you don't usually feel nauseated. If you want, you can show the probabilistic relevance of all these premises. Take the last one, which is known as the base rate or prior probability: If I am a healthy person and don't usually suffer from nausea, the mushroom is most probably the culprit. If, on the other hand, I suffer from a gastrointestinal condition and I often have bouts of nausea, my *post hoc* inference will be less strong.

Indeed, almost all of our everyday causal knowledge is derived from such intuitive *post hoc* reasoning. For instance, my laptop is behaving strangely after I accidentally dropped it on the floor; some acquaintances unfriended me after I posted that offensive cartoon on Facebook; the fire alarm goes off after I light a cigar. As Randall Munroe (the creator of the web comic *xkcd*) once put it: "Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there.'" Most of the time, these premises remain unspoken, but that cannot be a problem *per se*. Practically every form of reasoning in everyday life—even in science—contains plenty of hidden premises and skipped steps.

So how about the *post hoc* arguments that we hear from quack therapists and other pseudoscientists? Someone takes a dose of *oscillococcinum* (a homeopathic remedy) for his flu, and he feels better the next day. If he attributes this to the pill, is he committing a fallacy? Not obviously, or at least not on formal grounds. It all depends on the plausibility of a causal link, the availability of alternative explanations, the prior probability of the effect,

etc. Dismissing any such inferences as *post hoc ergo propter hoc* fallacies is just a knee-jerk reaction. The real problem with homeopathy is that there is no possible physical mechanism because of the extreme nature of the dilutions and because randomized clinical trials have never demonstrated any effect whatsoever. But appealing to *post hoc* reasoning by itself is not fallacious. We do it all the time when we're taking real medicine and conclude that it "works for us."

Ad hominem

Perhaps the most infamous among the fallacies is the *argumentum ad hominem*. The principle is quite simple. If you are assessing the merits of someone's argument, you should not attack his or her personal background or motives. If you play the man instead of the ball, you are guilty of *ad hominem* reasoning. But are things so simple?

Let's trot out the Fallacy Fork again. If your *ad hominem* argument takes a deductive form, then of course it is invalid. Even a broken clock is right twice a day. Take this argument: "Researcher A is in the pocket of the pharmaceutical industry; therefore, it follows that A's study is flawed." If the "therefore" is intended to be deductive, then clearly the argument is invalid. But how often do you encounter *ad hominem* argument in this strong form?

So we move to the second prong of the Fallacy Fork. Take the following, weaker version of the same *ad hominem* argument: "Researcher A published a study on the efficacy of a certain antidepressant, but he's in the pocket of the pharmaceutical company that manufactures the drug. Therefore, we should take his results with a large grain of salt. Better to have an independent team replicate the study." Now this sounds a lot more reasonable. The second argument is nondeductive and "defeasible," which means that it is inconclusive and up for revision. Almost all arguments in real life are like that. The fact remains that the argument has an *ad hominem* structure. But should we really dismiss it on those grounds?

In reality, we cannot do without *ad hominem* reasoning. This is because the fabric of human knowledge is deeply social. Virtually everything we know derives from what other people have told us. Only a tiny fraction of the knowledge we possess is supported by the evidence of our own senses. The rest is, literally, hearsay. Life is too short to investigate everything by yourself. No wonder we are very sensitive to the reputation and trustworthiness of our sources (Sperber et al. 2010).

Many *ad hominem* arguments, in most contexts, are therefore perfectly reasonable. Much depends on factors that cannot be captured in the formal argumentation scheme: psychological assumptions about prejudice and bias, the past track record of our sources, the relevance of personal background for the issue at hand, background knowledge about hidden agendas. In the courts, *ad hominem* arguments are standard fare. Experts and witnesses can be discredited and censured because of a hidden agenda, bias, or conflict of interest. Naturally, it is logically possible that even a biased witness might be offering an honest testimony. But courts are not schools of logic.

In *The Demon-Haunted World*, Carl Sagan unwittingly illustrates the problem with fallacy theory. In his section about *ad hominem* reasoning, Sagan writes—perhaps bending over backward to show his good will—that even skeptics are sometimes guilty of *ad hominem* reasoning, as in the following example: "The Reverend Dr. Smith is a known Biblical fundamentalist, so her objections to evolution need not be taken seriously" (Sagan 1996, 212). The little vignette—as usual in these discussions—was dreamt up by Sagan himself. It's just a pedagogical straw man, easy to knock down.

But actually, unless Sagan's argument is meant to be deductive (first prong), it is not fallacious at all (second prong). If we know that the good Reverend is an evangelical Christian, who dogmatically clings to a literal reading of Scripture, of course this will color our judgment about her arguments against evolutionary theory. I'd go even further: pragmatically speaking, this fact alone is reason enough to dismiss her arguments and not to waste any further time on them. It's simply naive to think we have an obligation to scrutinize the arguments of every single crank. In an ideal world perhaps, with unlimited time on your hands, but not in this one. So, *ad hominem* arguments are indispensable for navigating our way through a social world.

None of this is to deny that, logically speaking, even a die-hard creationist could conceivably level a good argument against evolutionary theory. If you think that the Reverend's argument *must* be wrong, given her evangelical faith, you are making an error of deductive logic. But let's be honest: If some Jehovah's Witnesses hand you a pamphlet with "scientific" arguments against Darwin, are you going to give them your full attention, lest you succumb to *ad hominem* reasoning?

If we adopt deduction as the norm of rationality, the whole of science goes out of the window. Science is based on trust and reputation, because empirical evidence is deeply testimonial. Researchers have to report their affiliation, funding sources, and possible conflicts of interests, and fraudsters are harshly punished. We want to know who they are, and we want *them* to know that their reputation is at stake. Imagine if *Science and Nature* were to publish anonymous papers about certain revolutionary discoveries made in unnamed labs. Would anyone be inclined to take them seriously?

To be sure, some *ad hominem* arguments are uncalled for and distract from the issue at hand. But where to draw the line? Again, this depends on the specific context, which cannot be captured in an argumentation scheme. A possible rule of thumb is this one: "If it's possible to play the ball, don't play the man. If not, play the man." But even this pragmatic rule will only get you so far. There's no neat formula for distinguishing good *ad hominem* arguments from bad ones.

Fallacies Galore

The main thesis of our paper is that each and every fallacy in the traditional list runs afoul of the Fallacy Fork. Either you construe the fallacy in a clear-cut and deductive fashion, which means that your definition has normative bite but also that you hardly find any instances in real life; or you relax your formal definition, making it defeasible and adding contextual qualifications, but then your definition loses its teeth. Your "fallacy" is no longer a fallacy.

Let's briefly consider some other examples. Arguments from ignorance (*argumentum ad ignorantiam*), according to the standard view, are fallacious because of the following well-known bit of wisdom: "absence of evidence does not constitute evidence of absence." But as a matter of fact, it often does, and people turn out to be attuned to this (Hahn and Oaksford 2007). Here is a perfectly decent argument from ignorance, which is even used by skeptics: "Recovered memories about satanic cults sacrificing babies are probably the product of confabulation and suggestion, because we have never found any material traces of these atrocities." This argument is acceptable, as we argue in the paper, because the hidden premises are probabilistically justified (in particular, concerning the "likelihood" of finding such evidence on the assumption that these cults exist).

The so-called genetic fallacy is a relative latecomer to the party, having been coined only about a century ago. It draws (negative) conclusions about X by pointing to the origins of X. It's a close neighbor to *ad hominem* reasoning. In reality, once again, many such arguments are not fallacious at all. For instance, if you can explain how out-of-body experiences originate neurologically, or even induce them in the lab, you make supernatural explanations less likely. Deductively, such an argument is fallacious, but probabilistically, it has strong probative weight. Someone who dismisses this as a "genetic fallacy," as spiritualists and parapsychologists often do, is just not getting the point. In Joseph Heller's *Catch-22*, the protagonist Yossarian at some point presents the following argument: "Just because you're paranoid doesn't mean they aren't after you." Deductively speaking, Yossarian has a point. But the comment is funny precisely because, *pace* deductive logic, it is absurd. If a psychiatrist tells you that your friend suffers from paranoid psychosis, you will not take seriously your friend's claim that he or she is being persecuted by the CIA (even though it is *logically* possible!).

The fallacy of affirming the consequent, according to the standard story, goes as follows: "If A then B. / B. / Hence: A." Once again, the schema is deductively invalid, but many arguments instantiating it have strong probative value, depending on the circumstances. Such arguments are simply known as *inferences to the best explanation*. For instance: "my car starts if someone turns the ignition key. / I hear my car starting. / Hence: someone must have turned the ignition key." Logically invalid but pragmatically justified given some probabilistic assumptions.

One final example: an *argumentum ad verecundiam*, argument from authority, states that proposition P is true because some authority X has claimed that P is true. As we saw earlier, much of our knowledge is testimonial, and therefore based on authority. There is nothing wrong with arguments from authority, provided that you bear in mind certain questions: Does the claim fall within X's domain of expertise? Are there other experts available, and if so, do they agree? What is the track record of X when it comes to similar claims? Ironically, the problem with pseudoscientists, and conspiracy theorists in particular, is not that they rely too heavily on arguments from authority but too *little*. They are excessively suspicious of authority. Anything coming from established academic institutions, or from the "mainstream media," is immediately discredited. Indeed, the diagnostic label "argument from authority" is a convenient excuse for them to reject any form of respected authority.

Paper Tigers

Pure fallacies are rare specimens. They are found in logic textbooks but rarely in real life. If you think about it, this makes sense. The function of reasoning, according to the argumentative theory of reasoning of Hugo Mercier and Dan Sperber (2011), is to convince other people and to be persuaded in return. But arguments that are too blatantly fallacious cannot perform this function. Deductive versions of *ad hominem* or *post hoc ergo propter hoc* are just too easy to debunk. Your audience sees right through them. Why would you bother making them?

The odds of finding such paper tigers in real life are low. If you believe you did spot one, chances are that you missed something or that the case is less than clear-cut. Perhaps you've exaggerated the intended strength of the argument by portraying an inductive and defeasible argument as an example of deduction, by glossing over some tacit probabilistic assumptions, or by stripping the argument to its bare form and then knocking it down.

In other words, perhaps you've built a straw man (itself a supposed "fallacy" for which no formal definition can be given). For instance, if you're being uncharitable, you could flag my mushroom argument as a fallacy by misconstruing it as a piece of deduction. But I'm not saying that the mushrooms *must* be the culprits by dint of deductive logic. I'm just saying that they are the most *likely* cause of my nausea given the circumstances.

None of this is to suggest that people don't use bad arguments. But lazy and sloppy arguments are much more common than cut-and-dried fallacies. People often take pot shots when they are arguing, offering the barest outline of a weak or inconclusive argument, without spelling out their crucial premises and without making clear the structure and intended force of their argument (Mercier and Sperber 2017). In a cooperative context, the audience needs to reconstruct the speaker's argument and fill in the blank spaces, preferably in a charitable way. It is true that this principle of charity can also be abused, for instance in the phenomenon of innuendo and plausible deniability, where the speaker hints at a dubious argument but then hides behind a cloak of ambiguity. For instance, I may not explicitly set up an argument to discredit someone's reputation, but I can insinuate it and hope that the audience gets my drift ("We all know that X is being paid by the pharmaceutical industry"). *A fortiori*, once you have to take into account these ambiguities and subtle means of deception, the formal definitions of fallacies become completely unhelpful.

Conclusion

Language can bewitch us. If a word exists, we tend to assume that there must be something in reality to which it refers. Labels are meant to be slapped onto things, right? The traditional taxonomy of fallacies, with its portentous Latin phrases, creates the impression that here we are dealing with established and indubitable theoretical results. Does an argument exhibit structure X, following steps Y and Z? Then we blow our whistle: "fallacy"! Do we hear someone drawing causal inferences from successions of events? *Post hoc ergo propter hoc*! Is someone relying on authority to make a point? *Ad verecundiam*! Playing the man rather than the ball? *Ad hominem*!

Arthur Schopenhauer, in his sarcastic little book *The Art of Being Right* (1896), expressed the ultimate dream of all argumentation theorists: "It would be a very good thing if every trick could receive some short and obviously appropriate name, so that when a man used this or that particular trick, he could be at once reproached for it." That would be a splendid thing indeed! Alas, the real world is a bit more complicated. The diagnostic labels of fallacy theory are much less useful for combating irrationality than is often assumed. The standard list, handed down through the ages since the days of Aristotle, is a blunt instrument in real-life discussions. Virtually every definition of a fallacy runs into the Fallacy Fork: either it singles out invalid arguments that rarely occur in real life, or it does apply to real life but turns out to be toothless.

By carelessly throwing around labels and crying foul at every turn, defenders of science and reason may actually harm their own cause. People may start to harbor sympathy for the targets of such unfair dismissal—in other words, for woo. And indeed, the complacency of skeptics is understandable. Precisely because doctrines such as homeopathy and astrology have been debunked so many times in so many ways, and because it is so unlikely that its advocates will ever rehabilitate their cause, it is tempting for skeptics to become lazy and smug. If you have the truth on your side anyway, why not?

But that would be a pity indeed. Even bad ideas don't deserve bad criticism. It's time for skeptics and other fallacy buffs to get rid of fallacies. ■

References

Boudry, Maarten, Fabio Paglieri, and Massimo Pigliucci. 2015. The fake, the flimsy, and the fallacious: Demarcating arguments in real life. *Argumentation* 29(4): 431–456. doi: 10.1007/s10503-015-9359-1.

Hahn, Ulrike, and Mike Oaksford. 2007. The rationality of informal argumentation: A Bayesian approach to reasoning fallacies. *Psychological Review* 114(3): 704–732.

Mercier, Hugo, and Dan Sperber. 2011. Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences* 34(2): 57–74.

———. 2017. *The Enigma of Reason*. Cambridge, MA: Harvard University Press.

Pinto, Robert C. 1995. Post hoc ergo propter hoc. *In Fallacies: Classical and Contemporary Readings*, edited by Hans V. Hansen and Robert C. Pinto, 302–311. Pennsylvania: The Pennsylvania State University Press.

Sagan, C. 1996. *The Demon-Haunted World: Science as a Candle in the Dark*. New York: Random House.

Schopenhauer, A. 1896. *The Art of Being Right* (Die Kunst, Recht zu behalten). Available online at https://en.wikisource.org/wiki/The_Art_of_Being_Right.

Sperber, Dan, F. Clément, C. Heintz, et al. 2010. Epistemic vigilance. *Mind & Language* 25(4): 359–393. doi: 10.1111/j.1468-0017.2010.01394.x.

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BIGFOOT AS BIG MYTH:

7 PHASES OF MYTHMAKING

During its history, the hairy man-beast has evolved through at least seven **mythical embodiments.**

JOE NICKELL

Dedicated to the memory of Michael Dennett, on the fiftieth anniversary of "Bigsuit."

The hairy man-beast known as the "Sasquatch" or "Bigfoot" is now ever present in North American culture. Supposedly a throwback to our evolutionary past, it is an "ape-man" version of us just as the little-bodied, big-headed, humanoid extraterrestrial is a futuristic one. Together they represent powerful mythologies for our shrinking planet—Bigfoot as the very symbol of the endangered species and ET as the promise that we are not alone in the universe.

1 Reporting 'Wild Men of the Woods'

In early North American accounts, the antecedent of today's Bigfoot was typically called a "wild man of the woods"—a European term from as early as the sixteenth century (Nickell 2011, 44). From 1818, when the earliest known newspaper account (in the Exeter, New Hampshire, *Watchman*) referred to an animal "resembling the Wild Man of the Woods," accounts over the next century used that term or variants, such as *wild man*, *wild child*, *wild boys*, or the like (Bord and Bord 2006, 3–24).

Typically the terminology described actual humans—including genetic oddities covered with hair and long-haired hermits and deranged people—but also the orangutan or other apes (thought perhaps escaped from traveling menageries) and real or imagined mystery woodland creatures. One creature, reported in Kansas in 1869 and referred to as a "wild man or animal," had "a stooping gait" and "very long arms with immense hands or claws"—"generally" walking "on its hind legs but sometimes on all fours" (Bord and Bord 2006, 10). It was likely a bear, since bears often stand on their hind legs and even walk when in their "alert" mode (Nickell 2013). As cryptozoologist Jeff Meldrum (2006, 204) concedes, "In behavior and appearance, no other animal is more subject to anthropomorphism than is the bear."

In the late 1830s, a "wild child" was reported swimming in an Indiana lake. In the 1860s, a Nevada creature was spotted carrying a rabbit and a club. A few others were similarly armed, including a six-foot bearded "wild man." Another "wild man" had "long matted hair and a beard," and so on. Such cases were reported well into the twentieth century (Bord and Bord 2006, 218–229). A few were allegedly captured—notably "Jacko," a hairy "half man, half beast" who stood only four feet seven inches tall. It was supposedly apprehended in 1884 by railway men and kept in an area jail (as reported in a Victoria, British Columbia, Canada, paper), but the story appears to have been a reporter's hoax (Nickell 2011, 57).

In 1924, some prospectors in Washington State had their cabin pelted with rocks by "mountain devils" (rumored to have been pranksters), and in the same year a man named Albert Ostman claimed he was kidnapped and held by a family of wild creatures (although he did not tell his tale until 1957) (Daegling 2004, 67–70).

Much earlier, in 1871, *The New York Times* had seen a trend: "As most of our readers are probably aware, there is at present roaming over the United States, and for aught we know, making occasional excursions into British America [Canada] and Mexico, a singular creature known as the 'Wild Man.'" The entity was characterized by seeming to be almost everywhere and having the "peculiar power of eluding capture" (qtd. in Arment 2006, 29).

2 Retrofitting Native American Monsters

It is common to suggest that Native Americans of the Pacific Northwest told stories and made images of hairy man-beasts similar to the modern Bigfoot. According to major proponents of this notion (Hunter with Dahinden 1993, 15), "The earliest-known 'recorded' references to the Sasquatch are found on the carved totem poles and masks of the coast Indians of British Columbia, particularly on those of the Kwakiutls." Proponents cite such mythical creatures as the Dsonoqua and the Buk'wus.

Actually, the Kwakiutls' Dsonoqua were giant, man-sized cannibals who lived in houses deep in the forests. They had black bodies with hairy hands, and their eyes

Kathy Moskowitz Strain

Native American carved wood mask of "wild woman of the woods"

Elsewhere (Nickell 2011, 184–186) I have shown how the alien likeness evolved into its now standard humanoid form; here I trace the evolution of the North American hairy man-beast from its earliest origins through a series of transformations, each taking the concept in a new direction without, however, necessarily replacing the one from which it grew.

were deeply set. They were usually represented as females who abducted children for their tender flesh, collecting them in a basket they carried. Thus, she was a type of bogeyman—or bogeywoman. She was depicted with lips pursed so as to give her fearsome cry, "Hu! Hu!" (Alley 2003, 151–152; *The Spirit World* 1992, 47; Taylor 1994, 90–91). Similar tales were told by the Salish Indians of the Fraser Valley, British Columbia (Hunter with Dahinden 1993, 15).

As to the Buk'wus, another creature of Kwakiutl folklore, he was man-sized or smaller but hairy and having many supernatural features. For example, he was ice cold and could move in an instant to a location far away (Alley 2003, 151–153). The Buk'wus—and a very similar Pu'gwis of the Tsimshian people—were actually spirits having the facial features of a human corpse, such as stretched skin and lips curled away from the teeth (Taylor 1994, 90). Clearly neither was a Bigfoot.

Still, there were other supposed candidates. The Tlingits of southeast Alaska believed in a man-sized hairy creature called "Kushtakaas" or "land-otter man." Essentially such beings were men, but they had become mad—either by being lost or nearly drowning—and, growing hair over their bodies, went to live among others similarly afflicted. They sometimes walked on all fours in keeping with their otter-like transformation. Traditionally, they were feared for their ability to capture a person's soul, and thus are more analogous to zombies than Bigfoot (Alley 2003, 137–138).

The list goes on. However, whenever believers have attempted to equate Bigfoot with Native American folkloric entities, they have engaged in retrofitting (after-the-fact matching) and, indeed, an obvious "exercise in confirmation bias" (Loxton and Prothero 2013, 33). Nevertheless, this process remains essential to Bigfoot mythmaking. (For more on the Native American images and traditions, see Halpin 1983.)

3 Creating 'Sasquatch'

Although the name Sasquatch is often said to be Native American, it was actually coined in the 1920s by a British Columbia teacher and Indian agent, J.W. Burns. Some say Burns "Anglicized" a Native American term, but really his Native Coast Salish informants had several different names for various folkloric entities, and he wanted to invent a single term for all the alleged creatures. He harmonized some of the names—including Sokqueatl or Soss-q'tal—into "Sasquatch" (Coleman and Clark 1999, 215).

Burns himself quoted stories from elderly Indians who had encountered wild men. For example, one informant from the Chehalis Reserve saw what he took "at first sight to be a huge bear crouched upon a boulder," but when it stood up he saw it was a "man—a giant, no less than six and one-half feet in height, and covered with hair" (Burns 1929).

Some say Burns "Anglicized" a Native American term, but really his Native Coast Salish informants had several different names for various folkloric entities, and he wanted to invent a single term for all the alleged creatures.

Another Native American, from the Skwah Reserve had seen several such wild people. He shot what he, too, first "took for a bear," coming out of a hole in a great cedar, but then he saw it actually looked like a nude "white boy." Thus provoked, a "wild woman" also came out. "Her face was almost negro black and her long straight hair fell to her waist. She was the height of a tall man, about six feet, but much broader," he said. She spoke to him in a dialect he understood, ending with, "you'll never kill another bear." So was it a bear and cub—in part, or all, a fantasy tale—or was it as Burns opines, one of "the Sasquatch people" with a white boy, stolen or found?

As Burns's new term began to catch on, it helped turn various folkloric concepts into an increasingly uniform one. It became the "Indian" name for anything that could be construed as a man-beast. The "wild man of the woods" was becoming a rather bearlike Sasquatch.

4 Discovering Big Footprints

The earliest North American record of potential man-beast footprints is from 1811 (reported by trader/explorer David Thompson, who thought it likely "the track of a large old grizzled bear" as quoted in Hunter with Dahinden 1993, 17). Not only is a bear's hindfoot "remarkably human-like," but the hind- and forefoot may superimpose to look like the huge track of a bipedal creature (Napier 1973, 150–151). There were few reports of alleged Sasquatch footprints until 1930, when berrypickers near Mount St. Helens discovered huge humanlike tracks that encircled them. But more than half a century later, a retired logger named Rant Mullens confessed he had donned carved nine-by-seventeen-inch feet to make the tracks. Meanwhile, in 1951, in the Himalayas, a footprint of a Yeti, or "Abominable Snowman," was photographed by explorer Eric Shipton and widely circulated in the United States (later explained as a probable animal track, altered and enlarged by the melting snow) (Nickell 2011, 59, 68). The stage was now set for another watershed moment.

In 1958, a Sasquatch seemingly made several visits to a road construction site at Northern California's Bluff Creek. Its tracks were discovered by a bulldozer operator, Gerald "Jerry" Crew, a photo

of whom—holding up a cast of a giant footprint—was spread by a wire service across the country. Consequently, the name "Bigfoot" (which first appeared in the *Humboldt Times* on October 5, 1958) began to become widespread.

The family of Bluff Creek road contractor Ray Wallace informed the press—after Wallace's death in 2002—that he had faked the 1958 tracks. They even produced pairs of carved feet that matched the Bluff Creek tracks (Daegling 2004, 29, 73; Coleman and Clark 1999, 39). However, the man-beast myth was now already entrenched, and, meanwhile, the 1958 Bluff Creek hoax had resulted in the pseudo-Indian term *Sasquatch* largely being replaced by the descriptive term *Bigfoot*.

Jerry Crew with a "Bigfoot" track cast.

Having previously been scarce, after 1958 reports of Bigfoot tracks began to proliferate. Tracks were reported with two to six toes and ranging in length from eleven and three quarters to twenty-one inches. Over the years the feet began to become rather standardized, usually having five toes and commonly measuring in the sixteen-to-eighteen–inch range (see Bord and Bord 2006, 215–310). And, in what seems likely to have been one-upmanship on the part of Bigfoot hoaxers, some of the tracks began to become more sophisticated.

During the 1960s, Bigfoot tracks tended to be rather rectangular in shape: the big toe was only a bit larger than the others and all five were "arranged almost in a straight line across the front of the rectangular foot pattern," according to skeptic Michael Dennett. Dennett (1996, 120, 122) noted that fake footprints subsequently improved in design so that the rectangular form was rarely seen anymore. Further sophisticated elements began to appear.

For example, more than a thousand tracks were left in 1969/1970 at Bossburg, Washington, by Bigfoot—or "Clubfoot" or "Cripplefoot" as the creature has been dubbed. They were ostensibly made by a creature with a congenitally deformed right foot. A Bigfoot-believing anthropology professor, the late Grover Krantz, asserted with hubris, "This requires an expert anatomist with a very inventive mind, more so than me, and I seriously doubt that any such person exists" (Krantz 1992, 83). However, anthropologist David J. Daegling observes that templates for Bigfoot tracks, both normal and deformed, were available in dozens of textbooks. "All a hoaxer had to do was have the wherewithal to scale them up, and he or she did not need to know one iota of anatomy to do so" (Daegling 2004, 87).

Again, in 1982, oversized footprints were discovered in Oregon with dermal ridges (those that on the hands produce fingerprints). Although the fact impressed many (Meldrum 2006, 249–259), it seems odd that previous creatures did not exhibit such features. The effect was that hoaxers were using more and more clever means to convince others that Bigfoot was real. A wildlife biologist and a professional tracker subsequently reported evidence of hoaxing, and Michael Dennett produced similar impressions (Dennett 1989).

5 Witnessing 'Bigsuit'

One series of Bigfoot tracks assumes special importance because of being found during "one of the most momentous events in the annals of Bigfoot hunting" (Bord and Bord 2006, 90). It began on October 20, 1967, when longtime Bigfoot enthusiast Roger Patterson—known as a "repeater" because of his frequent "discovery" of Bigfoot tracks—was riding horseback with friend Bob Gimlin at Bluff Creek (the area where Ray Wallace's hoaxed tracks had been made). Patterson had a 16mm movie camera and had announced his intention of filming the elusive creature.

It appeared, seemingly on cue, and Patterson filmed it briefly as it strode away with a seemingly exaggerated stride, as if, wrote one critic, "a bad actor were trying to simulate a monster's walk" (Cohen 1982, 17). (See Figure 1.) Patterson's creature, dubbed "Patty," had hairy, pendulous breasts—a feature so convincing, some thought, that it argued against the film being a hoax. However, Patterson had published in his book the year before a drawing of just such a female of the supposed species (Patterson 1966, 111).

The Smithsonian Institution's John Napier analyzed the film frame by frame and concluded that the figure's walk was consistent with that of a man striding in exaggerated fashion. "The upper half of the body bears some resemblance to an ape and the lower half is typically human," wrote Napier (1973, 90–91). "It is almost impossible to conceive that such structural hybrids could exist in nature. One half of the animal must be artificial. In view of the walk, it can only be the upper half." Napier summed up, "I could not see the zipper" (1973, 91, 95).

As it happened, early in this century, a Patterson acquaintance named Bob Heironimus confessed it was he who had worn the ape-man suit, and others corroborated Heironimus's having had such a costume at the time. Also, magician-turned-costume-seller Philip

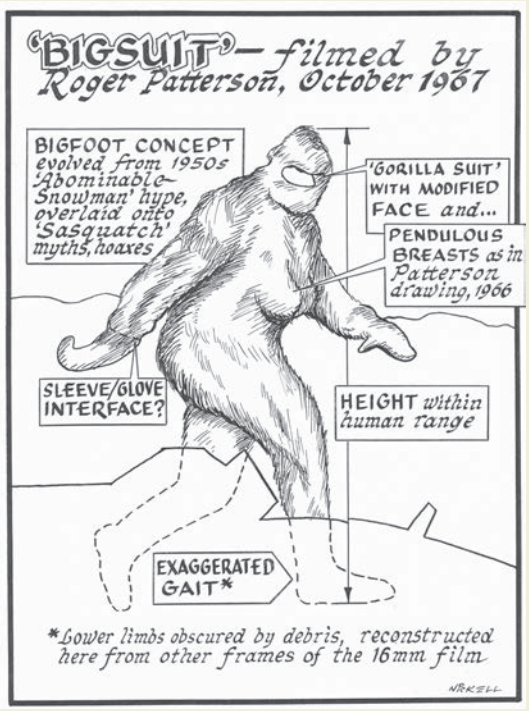

'BIGSUIT'—filmed by Roger Patterson, October 1967
BIGFOOT CONCEPT evolved from 1950s 'Abominable Snowman' hype, overlaid onto 'Sasquatch' myths, hoaxes
'GORILLA SUIT' WITH MODIFIED FACE and...
PENDULOUS BREASTS as in Patterson drawing, 1966
SLEEVE/GLOVE INTERFACE?
HEIGHT within human range
EXAGGERATED GAIT*
*Lower limbs obscured by debris, reconstructed here from other frames of the 16mm film
NICKELL

Figure 1. Analysis of a frame from the 1967 Patterson "Bigfoot" film shows evidence of fakery (drawing by the author). Later a Patterson acquaintance named Bob Heironimus confessed it was he who had worn the ape-man suit.

Morris (whom I know and have talked with about the case on several occasions) reports that he sold a six-piece gorilla suit to Patterson, along with extra fake fur he had asked to be included. This was obviously used to transform a gorilla suit into "Bigfoot"—or rather "Bigsuit" (Long 2004; Nickell 2011, 58–72).

Nevertheless, the Patterson film became, for True Believers, long-sought-after supposed proof of Bigfoot's existence. They were supported by Grover Krantz, who believed Patterson's Bigfoot was a surviving Gigantopithecus, a "Giant Ape" of South Asia that went extinct some 150,000 years ago (Krantz 1992; 1999).

Other Bigfoot hoaxes followed, including one near Mission, British Columbia, on May 1, 1977. A few months earlier some Cashton, Wisconsin, youths admitted to a similar stunt, one dressing up as a Bigfoot-type creature with large wooden feet affixed to his shoes. Another such hoax took place in 1986 when a Pennsylvania man wore fake fur and a "wolfman" mask and alarmed nighttime drivers by appearing suddenly in their car headlights. I investigated and exposed a Bigsuit case in Western New York in 2006 (Nickell 2011, 72, 77).

A more elaborate hoax involved—as was advertised on carnival midways—a "Sasquatch Safely Frozen in Ice." It proved to be a fake made by a top Disneyland model maker. I viewed the exhibit in 1973 on the midway of the Canadian National Exhibition (where in 1969 I had worked as a magic pitchman). The freezer unit was out of order, the lid up, and the ice had melted somewhat exposing part of the figure. It was dark and decidedly rubbery. This brilliant hoax was crudely imitated in 2008 by filling a Bigfoot costume with animal parts (later replaced with inorganic materials), and freezing it. It reputedly sold on eBay for a quarter of a million dollars (Nickell 2011, 87–90).

6 Connecting with Extraterrestrials

After "flying saucers" were reported in 1947 and the UFO/alien craze subsequently developed into a myth paralleling that of Bigfoot, by the 1960s the two shared the "phenomenological landscape," according to UFO historian Jerome Clark (1998, I: 469). Noting that the "hairy bipeds" seemed "like some weird marriage of apparition and animal," Clark says, some began to wonder if Bigfoot and UFOs might be related. Maybe they were "a variety of UFO occupant, possibly a lower form of life used as a sort of test animal."

During the 1970s, a number of UFOlogists—such as Coral Lorenzen, Dr. Leo Sprinkle, and Leonard Stringfield (the latter having promoted reports of crashed saucers and the secret retrieval of their humanoid occupants)—were "getting into the Bigfoot business too," say Janet and Colin Bord. They add: "There is no doubt a body of work that has Bigfoot-like creatures directly connected to UFO sightings" compiled by such UFOlogists. And authors such as Brad Steiger "were also producing paperback books full of new stories of UFOs and apemen" (Bord and Bord 2006, xi).

Some believers wonder if Bigfoot and UFOs might be related.

For example, consider some reports from a single year. Near Sykesville, Maryland, on May 29, 1973, a man claimed to see a UFO drop some object into a reservoir and then saw a luminous-eyed Bigfoot (Bord and Bord 2006, 270). Again, in October 1973 near Galveston, Indiana, one

"Jeff Martin" or "Jim Mays" (the same story is told with different names) was fishing at night when he twice saw a sandy-colored Bigfoot. When it ran off, "Almost instantaneously a glowing bronze light rose from the woods and shot away into the sky."

Yet again, on October 25, 1973, near Uniontown, Pennsylvania, a man and twin boys were in a field observing a red-glowing sphere when they spotted a pair of Bigfoot creatures—first thought to have been bears—walking along a fencerow (Bord and Bord 2006, 132, 274; Huyghe 1996, 70–71). Other Bigfoot/UFO links were reported over subsequent years.

There are even more far-out connections. Among alleged alien "contactees," some claim to connect with Bigfoot (Lapseritis 2014). For instance, one woman told a psychologist, "The Star People would have me read the newspaper and they would read through my eyes. They would see property that had Sasquatch on it that they would want me to buy" (qtd. in Clark 1998, I: 473). A writer for *Fate* magazine asserts that "the Sasquatch are actually extraterrestrials"—descendants of evolved "nature people" who migrated to Earth millions of years ago (Lapseritis 2014).

7 Entering Mystical Dimensions

Among the silly pretensions of "clairvoyant" Lorraine Warren (widow of Ed Warren, the notorious "demonologist" and supernatural huckster [Nickell 2012, 283–286]) is her story about telepathically communicating with Bigfoot. It happened "one spring," she says, "when we were lecturing in Tennessee and a reporter . . . told us about some hill people who kept insisting that something was threatening their children. . . . " Warren was in the fearsome bogeyman region when, standing beside a tree, she had a psychic vision of a shaggy-haired intelligent creature who had the "ability to project images telepathically into Lorraine's mind." Bigfoot told her he had injured his foot, which would keep him from the "secret cave" where his mate and children waited. Fortunately, she was able to send the creature healing images (Warren and Warren with Chase 1989, 35–43).

Warren (who exhibits several traits in common with a fantasy-prone personality [Nickell 2012, 347–348]) is not alone in believing Bigfoot has such abilities. "Let me tell you something," insists Bigfooter Ron Patillo. "These creatures are psychic. If you go in there with guns with the intent to shoot one to prove that they exist, you'll never see one. They'll pick up on you before you even get there. If you want to see them, you need someone like me to help you, who also has psychic ability" (qtd. in Burnette and Riggs 2014, 151–152).

Some "researchers" claim that Bigfoot are not merely psychic but perhaps entirely supernatural—a situation that has caused Bigfoot believers to split into supernatural and "flesh-and-blood" camps. Indeed, the supernaturalists express a variety of opinions, from believing the creatures are phantoms to considering them as "demon shapeshifters or interdimensional travelers" (Burnette and Riggs 2014, 167).

Although such ideas embarrass the flesh-and-blooders, some mystics think they can explain why Bigfoot is so "peculiarly elusive": They simply opine that the supposed creature has the power of invisibility (Burnette and Riggs 2014, 164–167)! Only time will tell what other notions will surface.

* * *

As the foregoing shows, during its history, the hairy man-beast has evolved through at least seven mythical embodiments: Wild Man, Indian Spirit, "Sasquatch," Bigfoot, Bigsuit, UFOlogical Entity, and Mystical Being—all perhaps summed up in one: Imaginary Creature (though based in part on the upright-standing bear). ■

References

Alley, J. Robert. 2003. *Raincoast Sasquatch*. Surrey, BC: Hancock House.

Arment, Chad. 2006. *The Historical Bigfoot*. Landisville, PA: Coachwhip.

Bord, Janet, and Colin Bord. 2006. *Bigfoot Casebook Updated: Sightings and Encounters from 1818 to 2004*. Enumclaw, Washington: Pine Winds Press.

Burnette, Tom, and Rob Riggs. 2014. *Bigfoot*. Woodbury, MN: Llewellyn.

Burns, J.W. 1929. Introducing B.C.'s hairy giants. *MacLean's Magazine* (April 1).

Clark, Jerome. 1998. *The UFO Encyclopedia*. In 2 vols. Detroit, MI: Omnigraphics.

Cohen, Daniel. 1982. *The Encyclopedia of Monsters*. New York: Dodd, Mead.

Coleman, Loren, and Jerome Clark. 1999. *Cryptozoology A-Z*. New York: Fireside.

Daegling, David J. 2004. *Bigfoot Exposed: An Anthropologist Examines America's Enduring Legend*. New York: Altamira Press.

Dennett, Michael. 1989. Evidence for Bigfoot? An investigation of the Mill Creek "Sasquatch prints." Skeptical Inquirer 13(3) (Spring): 264–272.

———. 1996. Bigfoot. In Stein 1996, 117–125.

Halpin, Marjorie M. 1983. *Totem Poles: An Illustrated Guide*. Vancouver, B.C.: University of British Columbia Press.

Hunter, Don, with Rene Dahinden. 1993. *Sasquatch/Bigfoot: The Search for North America's Incredible Creature*. Toronto: McClelland & Stewart.

Huyghe, Patrick. 1996. *The Field Guide to Extraterrestrials*. New York: Avon Books.

Krantz, Grover. 1992. *Big Footprints*. Boulder, CO: Johnson Books.

———. 1999. *Bigfoot/Sasquatch Evidence*. Surrey, BC: Hancock House.

Lapseritis, Kewaunee. 2014. Sasquatch: A terrestrial-extraterrestrial? *Fate* 726: 8–14.

Long, Greg. 2004. *The Making of Bigfoot*. Amherst, NY: Prometheus Books.

Loxton, Daniel, and Donald R. Prothero. 2013. *Abominable Science! Origins of the Yeti, Nessie, and Other Famous Cryptids*. New York: Columbia University Press.

Meldrum, Jeff. 2006. *Sasquatch: Legend Meets Science*. New York: Tom Doherty Associates.

Napier, John. 1973. *Bigfoot: The Yeti and Sasquatch in Myth and Reality*. New York: E.P. Dutton.

Nickell, Joe. 2011. *Tracking the Man-Beasts: Sasquatch, Vampires, Zombies, and More*. Amherst, NY: Prometheus Books.

———. 2012. *The Science of Ghosts*. Amherst, NY: Prometheus Books.

———. 2013. Bigfoot lookalikes: Tracking hairy man-beasts. Skeptical Inquirer 37(5) (September/October): 12–15.

Patterson, Roger. 1966. *Do Abominable Snowmen of America Really Exist?* Yakima, WA: Franklin Press.

The Spirit World. 1992. The American Indians series; Alexandria, VA: Time-Life Books.

Stein, Gordon, ed. 1996. *The Encyclopedia of the Paranormal*. Amherst, NY: Prometheus Books.

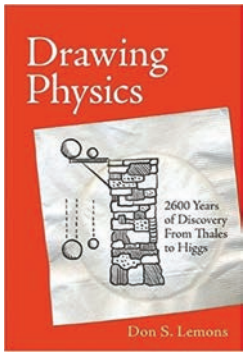
Taylor, Colin F., ed. 1994. *Native American Myths and Legends*. New York: Smithmark.

Warren, Ed, and Lorraine Warren (with Robert David Chase). 1989. *Ghost Hunters*. New York: St. Martin's Paperbacks.

Joe Nickell, PhD, did graduate work in folklore. A skeptical cryptozoologist, he is author of numerous books, including *Tracking the Man-Beasts.*

A History of Physics Worth Fifty-One Thousand Words

CELESTIA WARD



Drawing Physics: 2,600 Years of Discovery from Thales to Higgs. By Don S. Lemons. The MIT Press, Cambridge, MA, 2017. ISBN: 978-0262035903. 246 pp. Hardcover, $27.

In this little red book, Don S. Lemons has assembled a very useful and accessible collection of fifty-one physics concepts organized according to era and illustrated with drawings by Jesse Graber (as well as a few in Galileo's own hand). One need not have a degree in a STEM field—or even a good grasp of high school physics—to understand the ideas outlined. Far from presenting dry formulas and math problems, Lemons uses simple drawings to walk readers through discoveries that have helped humans grasp how the world around them works. Lemons says the book is for readers "interested in the world in which they live but who, for various reasons, know little mathematics or physics." Each section is a small, digestible vignette of several pages that can be read as a standalone explanation of a concept in physics. Due to this self-contained approach, there is, by necessity, a bit of repetition if you read the book straight through, as concepts are reviewed for an understanding of what comes next.

As the title states, the physics discoveries themselves are framed using drawings: not elaborate, comics-style panels or detailed technical illustrations but rather (as the cover implies) the scribbled-upon-napkin or back-of-the-envelope variety. The author explains how useful such "cartoon approximations" are in teaching otherwise complex ideas to students. He also paints a picture with words of how such images helped philosophers and scientists formulate their theories of the universe, taking us back to antiquity as a seventy-five-year-old Archimedes, drawing in the sand, yells out what turned out to be his last words, ordering a Roman soldier to "Stand back from my diagrams!" (30), or to seventeenth-century England, where an aloof and peculiar Isaac Newton sketched figures in the gravel walks of Trinity College (103). Drawings sometimes took the place of numbers, as with the electromagnetic discoveries of Michael Faraday, whose mathematical knowledge was not advanced enough to translate his ideas into formulas, but for whom "visualizations, of which the magnetic lines of force are a prime example, did the work of mathematics" (153).

The author explains how useful such "cartoon approximations" are in teaching otherwise complex ideas to students.

The collection begins by looking outward, as the ancient Greeks pondered the heavens, and ends with the search inward, for knowledge about matter's tiniest states, as Lemons takes us on an illustrated physics tour through antiquity, the Middle Ages, the early modern period, the nineteenth century, and the twentieth century and beyond (the book's five parts). The drawings are accompanied by scientific history, philosophy, and trivia that help unpack the thought process that led a particular thinker, or group of thinkers, to a discovery. We also get a feel for the sci-

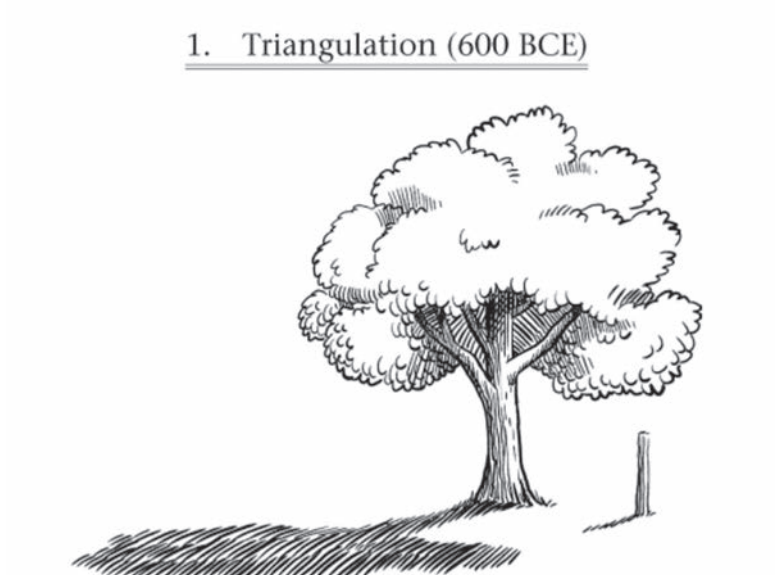
entific zeitgeist of many particular moments throughout humankind's search for knowledge. The ancient Greeks had an aversion to experiments and instead approached the study of nature as a process of inference. "To manipulate a natural phenomenon, is to spoil its naturalness—at least according to Aristotle" (17). The seventeenth century was characterized by viewing the world through a prism of materialism, as Christiaan Huygens put it, "the true philosophy, in which one conceives the causes of all natural effects in terms of mechanical motions" (118). Later, scientists in the Romantic period—the last to call themselves "natural philosophers"—would be inclined to see connections everywhere, imagining "that all the forces of nature were but different aspects of a single, all-encompassing, invisible power" (140).

While keeping each section brief and engaging, Lemons moves beyond workmanlike reporting of facts, pointing out how some scientists were a product of their time and how others went against the prevailing notions of their era. We see how ideas about the world evolved through both thought experiment and actual demonstrations—from the falling speeds of heavy versus light objects to the particle-wave duality of light. We see how some thinkers have tried to create a theory that will explain everything (something both ancient and modern thinkers have wrestled with), while others concentrated their efforts on fully dissecting one small aspect of how things work. From planetary orbits to magnetic fields to the atom, we also see how ideas in physics can represent fundamental, real aspects of how things work, or simply act as a model or placeholder explaining how things seem to behave—until a better model or more data comes along.

Each section not only contains a good description and analysis of the physics problem but also a few paragraphs on the scientist's personal life.

Each section not only contains a good description and analysis of the physics problem but also a few paragraphs on the scientist's personal life: here we see father-son rivalries, a family split by war, many expressions of piety and religious devotion, quite a few Nobel prizes awarded, and epitaphs carved on tombstones. Don't expect to see any contributions by female scientists highlighted, though: all of the major thinkers profiled are men, and women are mentioned a total of three times in the book (beer is mentioned twice). Lemons chose the material purely on the basis of what, as he states, *can be drawn and seen*—an approach that favors older astronomical problems over more recent studies. It is to his credit that he did not artificially shoehorn diversity into a landscape where it historically did not exist. Lemons might be accused of trespassing into the political arena in his section titled "Global Greenhouse Effect," where his last few paragraphs emphasize the conclusions of physicists studying global warming, point out the Genesis quote used by Senator James Inhofe to wrongly dismiss climate change, and urge us all to have "the courage to change those things that should be changed." It's an anomalous prescription I applaud in this otherwise purely descriptive book on science history and philosophy.

Readers will find the notes section useful but unobtrusive, and the book benefits from a well-prepared index. A must-have for teachers, *Drawing Physics* would also be enjoyed by any layperson interested in improving their grasp on physics and learning about the history of scientific thought. ■

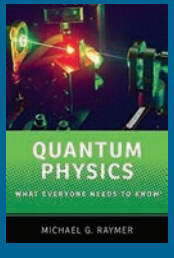


Celestia Ward began her career in academic publishing, then, after almost a decade editing books for the Johns Hopkins University Press, she decided a steady paycheck was not for her and instead pursued a career in the cartoon arts. She now runs Two Heads Studios in Las Vegas, Nevada, and expels a steady stream of skeptic and science-minded cartoons. (See one on the Last Laugh page of the May/June 2017 SI.)

[NEW AND NOTABLE

Listing does not preclude future review.

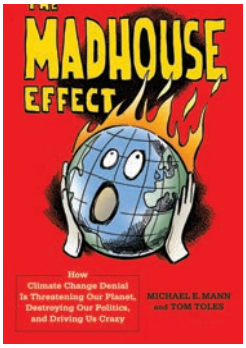
DEAR MARTIN / DEAR MARCELLO: Gardner and Truzzi on Skepticism. Edited by Dana Richards. This book is a major contribution to the history of modern skepticism. It will also be of considerable interest to the history and philosophy of science more generally. Martin Gardner comes back to life in the form of sparkling, never-before-seen correspondence with one of the most enigmatic figures of skepticism, sociologist and gadfly (and CSICOP cochair and eventual critic) Marcello Truzzi. The lively and surprisingly substantive and detailed exchanges are filled with fascinating insights into the intense intellectual debates, arguments, and disputes they and others had over how to identify crank science and scientists and how best—or even whether—to counter pseudoscience and occultism. Not to mention their differences on how scholars on the fringe should be treated. The letters animate the divergent perspectives and personalities of key figures who founded the modern skeptical movement. Divided into four sections: The Road to CSICOP, The Demarcation Problem, The Dissolution, and Return to Cordiality. Editor Dana Richards (George Mason University) expertly guides us through the nuanced issues. World Scientific, 2017, 458 pp., $88 hardcover, $48 softcover.



QUANTUM PHYSICS: What Everyone Needs to Know. Michael G. Raymer. A few years ago, Oxford University Press launched a highbrow version of the wildly popular "For Dummies" and "An Idiot's Guide" franchises—accessible introductions to complex subjects written by experts in the field. The Oxford series covers a broad range of topics from ADHD to Venezuela, but the new edition on quantum physics may be of particular use to skeptics and science literacy educators who want to refute or address pseudoscientific claims by New Agers (looking at you, Deepak Chopra) about the nature of quantum physics. Quantum physicist Raymer explains the basic principles of this field, complete with references and illustrations. The book is organized into hundreds of short, simple questions arranged in fourteen chapters covering everything from basic terms to nuances of quantum entanglement. Reading the book won't make you an expert on quantum physics, but it will arm you with a basic understanding of the topic. Oxford University Press, 2017, 336 pp., $16.95.

A Brilliant Climate Collaboration

ROBERT LADENDORF


MADHOUSE EFFECT
How Climate Change Denial Is Threatening Our Planet, Destroying Our Politics, and Driving Us Crazy
MICHAEL E. MANN and TOM TOLES

The Madhouse Effect: How Climate Change Denial Is Threatening Our Planet, Destroying Our Politics, and Driving Us Crazy. By Michael E. Mann and Tom Toles. Columbia University Press, New York, 2016. ISBN: 9780231177863. 186 pp. Hardcover, $24.95.

President Trump—who has called climate change a "hoax" and has pulled the United States out of the Paris climate accord—gives more urgency to reading Prof. Michael E. Mann and Tom Toles's excellent book, *The Madhouse Effect*, a short primer on climate change and its denial.

In a brilliant collaboration between a climate scientist known for the "hockey stick curve" that shows unprecedented global warming and a Pulitzer Prize–winning cartoonist at the *Washington Post*, Mann and Toles complement each other's work in chapters ranging from climate warming science explanations to the stages of its denial to making action plans for the future.

The chapter on the war on climate science is particularly enlightening, briefly tracing the history of the climate science doubters, many of whom, including scientists, were paid lavishly by fossil fuel advocates. Mann, the Distinguished Professor of Atmospheric Science and director of the Earth Systems Science Center at Pennsylvania State University, isn't above being a bit snarky at times in his writing and includes this quote from writer Upton Sinclair: "It is difficult to get a man to understand something, when his salary depends on his not understanding it."

Mann, who spoke at the Committee for Skeptical Inquiry's CSICon skeptics' conference in Las Vegas last October and is scheduled to do so again this year, also relates his own involvement in controversies over climate change studies, including Virginia's former Attorney General Ken Cuccinelli's ill-fated lawsuit against the University of Virginia over government-funded research on climate change by Mann. A lower court ruled that Cuccinelli provided no evidence of wrongdoing. One of Toles's cartoons drawn at that time on that issue is included in the book.

Toles's cartoons indeed provide fresh text breaks that illustrate what Mann writes about. There are just enough of them to provide occasional chuckles while reading about the serious science, history, and future of climate change.

Early in the book Mann explains how the word *skepticism* has been misused by climate change deniers and briefly explains scientific skepticism. He points out that the exploited weakness in science is the public understanding of it. "Deliberate confusion can be sown under a false pretext of 'skepticism,'" Mann writes. "And the scientific process is continually under assault by bad-faith doubt mongers."

In another chapter, they skewer most of the proposed geoengineering ideas to combat global warming, arguing that the costs are exorbitant, the technological challenges difficult, and the adverse regional climate effects real. Mann convincingly argues that geoengineering schemes will prove the law of unintended consequences.

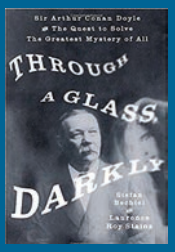
Early in the book Mann explains how the word *skepticism* has been misused by climate change deniers and briefly explains scientific skepticism.

The book lacks a glossary, which would have been helpful in briefly explaining scientific terms, identifying numerous organizations that are hard to keep straight as being for or against climate change science, and individuals. But Mann does include brief explanations within the text, so this omission is minor.

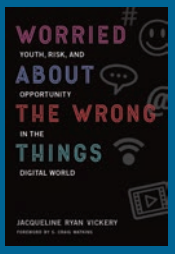
The authors remain hopeful about the ability of humans to adapt and help avoid the destruction of our planet, encouraging carbon pricing and promoting environmental sustainability in general. But Mann does say there's an urgency. "Dreams of slowly adapting to climate change," he writes, "will have to be replaced with the hard reality of an ever-escalating pace of disruption and unpredictability."

By the time the reader reaches that last chapter explaining "The Path Forward," the subtitle of the book will make perfect sense: "How Climate Change Denial Is Threatening Our Planet, Destroying Our Politics, and Driving Us Crazy." If a reader has time for just one book explaining climate change science and denial, *The Madhouse Effect* is the one to read. ■

Robert Ladendorf is a freelance writer, former chief operating officer at the Center for Inquiry Los Angeles, and coauthor of an article on "The Mad Gasser of Mattoon" for SKEPTICAL INQUIRER.



THROUGH A GLASS DARKLY: Sir Arthur Conan Doyle and the Quest to Solve the Greatest Mystery of Them All. Stefan Bechtel and Laurence Roy Stains. Spiritualism, a movement that attempted to show that the soul is eternal and to make contact with the dead, was a worldwide movement from the mid-nineteenth century to the 1930s with millions of adherents. Two journalists, fascinated by this extraordinary subject and concerned that Sherlock Holmes creator Sir Arthur Conan Doyle, perhaps its foremost spokesman, has been painted as "a credulous old fool," here attempt what they say is "an approach to the historical record without prejudice." They say they are presenting a "fair-minded report" of what they found. All sounds nice and balanced, but be aware that they also say, enigmatically, "We are not true believers, but it's fair to say we don't *not* believe" (their emphasis). And also that while they were impressed by "the thoughtfulness and sincerity" of the highly intelligent men and women who participated in this movement, "Skeptics quite willfully spread lies about them and attempted to ruin their lives." Of course. St. Martin's Press, 2017, 303 pp., $26.99.



WORRIED ABOUT THE WRONG THINGS: Youth, Risk, and Opportunity in the Digital World. Jacqueline Ryan Vickery. Vickery, assistant professor in Media Arts at the University of North Texas, takes a skeptical look at media and cultural narratives of risks that the digital world poses to children and teens. Divided into seven chapters in two parts ("Risk" and "Experiences"), topics include online bullying, suicide risk, online predators, pornography, and peer pressure. While there are real dangers—many of them exaggerated and sensationalized—Vickery suggests that a larger problem is the inequitable opportunities for youth participation in today's digital culture. Vickery proposes solutions and notes that the policies enacted on behalf of "endangered" children do not always benefit them; as S. Craig Watkins notes in the foreword, "As you read this book it is clear that youth labeled 'at risk' or 'disadvantaged' are seldom if ever genuinely considered in the policy prescriptions advocating risk avoidance and protection." The MIT Press, 2017, 360 pp., $35

—Kendrick Frazier and Benjamin Radford

Houdini's Remarkable Female Detective

TERENCE HINES

Houdini's "Girl Detective": The Real-Life Ghost-Busting Adventures of Rose Mackenburg. Compiled and introduced by Tony Wolf. 2016. ISBN: 9-781537-143965. 93 pp. Paperback, $8; Kindle edition, $6

Rose Mackenberg was a female private detective in the 1920s, an unusual occupation for a woman even today. She worked very closely with Harry Houdini in exposing mediums and spiritualists and continued that line of investigations and exposures after Houdini died. She was a remarkable woman, and the skeptical community knows little about her. Until the publication of this book, the only description of her was in a short piece by Loren Pankratz in the July/August 1995 Skeptical Inquirer (pp. 28–29).

Wolf's book is described as "an illustrated anthology of Rose Mackenberg's original 1929 newspaper article series detailing her sometimes hair-raising adventures exposing the chicanery of the ghost racket" (from the back cover). There is a thirteen-page introduction before the eight articles that Mackenberg wrote are reprinted. Wolf is too vague about the sources of these articles, saying only that they "were published as a series of weekly installments in several North American newspapers during 1929" (p. 21). The introduction describes Houdini and his interest in investigating spiritualists. However, it is totally without references to the larger literature on Houdini, which greatly limits its value. At one point, Wolf fails to follow up on a potentially important aspect of the articles. On page 17, he states that Mackenberg had "written a manuscript detailing her adventures in battling the 'spook racket'" that she never published but that "appeared as part of an eBay estate auction during November of 2012." And that's all—the reader is left hanging. Ten minutes of Internet searching revealed that the lot on eBay was listed at an outrageous price—$25,000—and didn't sell. The price did not include the right to publish the manuscript. Further, the manuscript was simply a combination of the articles Wolf has reprinted. Wolf should have included this information in his introduction.

The articles themselves are interesting and informative. Mackenberg writes well, with verve and wit. She goes into some detail about her adventures as an undercover agent for Houdini and how she carried out her missions. Unfortunately, the articles are presented verbatim and without any annotations—a problem since modern readers will not have the same common knowledge that readers had in 1929. In other places, Mackenberg's writing isn't clear. Both these problems would have been easily fixed had Wolf provided annotations to the text where needed. A few examples will suffice.

On page 28, the medium Laura Pruden of Cincinnati is discussed. She was said to be able to produce voices from beyond the grave. At the end of the section, Mackenberg writes, "So, when the hidden mechanics of the 'voice-from-the-grave' were advanced theoretically, there was much rejoicing among the materialistic anti-spiritualists…." But she never says what these "hidden mechanisms" were. It would be nice to know!

Making photographs of spirits was, as is well known, very popular among spiritualists. On page 31, we read about "the new Teutonic method of photographing any given set of characters against any background, even though miles away. An astonishing invention—and how the mediums are going to eat it up!" Sorry, but I have absolutely no idea what those clever German photographers were up to in 1929.

Several pages are devoted to a fake photograph said to show a multitude of ghosts of soldiers killed in WWI surrounding the cenotaph in London during an Armistice Day event. Mackenberg knew that her 1929 readers would know that the cenotaph was, and is, a major London memorial to the dead of WWI. But most modern readers won't know that.

I got the impression that at least some text that originally appeared in the articles was not included in the material reprinted here. For example, on page 74 Mackenberg promises to "tell you about the only spiritualist phenomenon for which Houdini could never find an explanation." But nothing of the sort is contained in the next article, which is the last in the book. Was this an error

on Mackenberg's part? Or did Wolf somehow omit the section thus referred to? In another location, page 92, Mackenberg refers to material she will write about "next week," specifically, "one of the earliest and most dramatic trials which took place in London in 1881." But page 92 is the very last page of text, and no discussion of any such trial appears anywhere in the book.

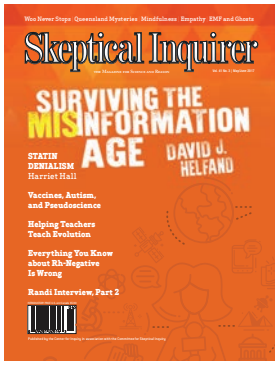
In addition to the problems noted above, it is especially troubling that the book is, to a degree, poorly sourced. For example, there is no date or publisher information to be found on the title page or anywhere else. Thus, citing the book will be a problem for anyone wishing to do so. Nor is there any indication of who Tony Wolf is and what, if any, expertise he has in examining psychic claims.

Making Mackenberg's writings widely available is an excellent idea. Thus, the shortcomings of this book are especially unfortunate since, with only a little extra effort, it could have been a tribute to Ms. Mackenberg and a welcome addition to the literature on early investigations of spiritualism. I only hope that Wolf will produce a second edition in which the problems noted here will be corrected. Rose Mackenberg deserves a much better book than this.

On a more general note, this book is obviously self-published and print-on-demand. This type of publication is becoming more and more common due to its ease and affordability. And it is not the only such skeptical book so published. Christopher Owen's *An Encyclopedia of Paranormal Hoaxes* is also undated and has no publisher indicated. Such self-publication is fine (I published my 2016 *History of Postal Service in Hanover, New Hampshire Since 1761* that way), but authors who go that route should be sure to include the standard bibliographic information: date and place of publication, a publisher—even if it is the author—as well as a short biography so the reader will be able to evaluate the author's credentials. ■

Terence Hines is professor of psychology at Pace University and author of *Pseudoscience and the Paranormal*.

LETTERS TO THE EDITOR]



The Age of Misinformation

"Surviving the Misinformation Age" (May/June 2017) offered my incredulous skeptical brain a real epiphany. We often simply cannot understand how the masses can possibly believe things that are, well, unbelievable. But people who read SI and our friends tend to be those who do know how satellites can tell us where we are, how surgery can change refraction of the eyes, and why the tides go in and out.

I think David Helfand's equating technology to magic really does explain how many people can see modern technology as magic—thus blurring the line between things that are simply technological innovations and unexplainable mysteries. This also explains to me why a number of science-fiction stories explain that microprocessors, fiber optics, and even velcro were provided by space aliens or time travelers. If you cannot understand the concept of layering one technology over another, then it seems like something impossible to invent with our (at least their) limited minds.

The article doesn't make clear how we could actually get a non-skeptic to sit while we explain science and technology in sufficient detail, but it did help to relieve my frustration with understanding how they might be thinking.

Brian Jay Gould
Plainsboro, New Jersey

The focus of the May/June 2017 Skeptical Inquirer on the Misinformation Age is very interesting reading. Although the emphasis is on today with false beliefs rejecting scientific truth and accepting pseudoscientific beliefs, David Helfand traces deliberate falsehoods back 2,400 years but blames their increase on our "technology saturated environment." He notes Harris quoted a speech by Demosthenes of Athens, "Although a witness who perjured himself could be prosecuted … an orator who spoke in court could indulge in as much fabrication as he wished without fear of punishment," and went on to state: "In short, nothing aside from the knowledge of the audience and the limits of plausibility restrained the orator from inventing falsehoods and distorting the truth." If "orator" is translated as "politician," this sounds very up-to-date!

David W. Briggs
Marion, Massachusetts

In Dr. David Helfand's "Surviving the Misinformation Age," he described how he presented public talks clearly showing why we can say that global warming stems largely from our burning of fossil fuels. He did it in seven steps that were "begging" for graphic support. So, I wrote him and asked if he had a set of slides or PowerPoint for doing that. He replied, sending me several slides he uses, but pointed out that his narrative always accompanied the slides (they aren't self-explanatory). I offered to write a narrative based on his article in SI to accompany the slides, and he consented.

His classes over recently, he responded to my efforts, liked what I did, made a few minor modifications, and said it would be ok to make available to interested persons. Perhaps you'd like to make this known to your subscribers (and also on the SI website). I have prepared a Word document with slides and commentary included and also a PowerPoint of the slides. I think this would be ideal for any teacher wanting to teach about climate change. This is now posted on my website at http://www.indiana.edu/~ensiweb/main.source.global.warmng.html. *[CSI has also placed a link to it with Helfand's article at http://www.csicop.org/si/show/surviving_the_misinformation_age.]*

Larry Flammer
Webmaster, ENSIweb
San Jose, California

Statin Denialism?

Thank you for the article by Harriet Hall on statins ("Statin Denialism," May/June 2017). I have taken statins for four years with little to no side effects. While both my wife and I are skeptics, the anti-statin fearmongers had caused us concern. Are statins perfect? Of course not. But simply put, they save lives.

We are happy that this topic was covered in Skeptical Inquirer. Overall, we both enjoy the quality and variety of articles in SI. Keep up the good work and I will keep subscribing.

Dan Dusa
Cincinnati, Ohio

I was very surprised—and disap-

pointed—by Harriet Hall's article in which she likens skepticism about statins to "alarmist misinformation." Unfortunately, she highlights in great detail statements from self-proclaimed "expert" Leonard Coldwell, but then quickly dismisses the carefully researched, scientifically based books, articles, and blog posts of Dr. Malcolm Kendrick, a Scottish physician who has studied heart disease and statins for over a decade. Kendrick does not ignore the "vast body of literature that contradicts [him]." To the contrary, Kendrick carefully investigates the claims that these studies purport to prove.

Curiously, Hall praises the review article ("Interpretation of the Evidence for the Efficacy and Safety of Statin Therapy") in the November 19, 2016, *Lancet*, saying it was "particularly thorough." This study's lead author is Rory Collins, head of the CCT (Cholesterol Treatment Trialists), a group that allows *no one* to see the data on which their conclusions are based! This seems the very antithesis of a skeptical attitude, which enjoins that the stronger the claims, the stronger the evidence must be. In addition, as shown in the "Declaration of Interests" in this *Lancet* review article, at least fifteen of the authors have ties to pharmaceutical companies. Why in the world should the scientific community accept interdicted data based on trials run by pharmaceutical companies? As Jerome Burne stated (http://healthinsightuk.org/2016/09/13/massive-statin-trial-that-aims-to-silence-all-the-critics-the-iron-fist-in-an-evidence-based-glove): "Authoritarian support for the status quo is common in politics and religion [but i]t's not supposed to be part of science." I suggest that Skeptical Inquirer invite well-respected statin critics to respond to Harriet Hall.

My mother ended up in intensive care in 2002, having her kidneys flushed out owing to rhabdomyolysis caused by statin use. Perhaps I should be grateful that my mother's doctor did not have the gall to say to us: "Statins: They work, bitches!"

Jan Behn
Madison, Wisconsin

I was surprised, and disappointed, to read the article on statin denialism. Dr. Hall failed miserably at presenting a skeptical analysis.

Raised in the Show Me State and the land of Mark Twain, you will find no more natural a skeptic than myself. For the record, I am *not* a denialist that "statins work, bitches."

Statins have produced over $100 *billion* in revenue for drug companies. The first rule of skepticism is, "Where you find incredible amounts of money you will find incredible impetus for crimes ranging from fibbing all the way to outright fraud."

Dr. Hall dismisses coq10 as if it were irrelevant. Numerous reputable studies and NIH recommendations would disagree.

She dismisses side effects as if they don't exist. I suggest that they are drastically underreported by patients. Statins are most heavily prescribed to the older population who suffer with failing muscles and minds regardless.

The mounting evidence suggests that statins work, bitches, in the same vein that driving nails with a rock works, bitches. There simply has to be a better way, and we are likely being deprived of it by the conveyor belt of money that runs into the drug companies' banks each day.

Earl McAllen
Cedar Park, Texas

As a recently retired physician and a skeptic, I found myself to be rather uncomfortable while reading the article "Statin Denialism."

I am unfamiliar with Dr. Leonard Coldwell; however, based on his description in the article, I have no problem with the rather shrill criticism directed toward him.

However, as skeptics, we should take a more nuanced view of this subject.

A few years ago, I was in a medical review conference listening to a speaker who I had heard several times before. He was a biochemist who had studied lipids for many years and a physician, a board certified cardiologist with a special interest in the prevention of coronary vascular disease. He was an enthusiastic prescriber of statins as a means of lowering cholesterol levels in the blood and the risk of cardiovascular disease. On this occasion, near the end of his presentation, he lowered his eyes and wistfully shared with us that his more recent review of the literature casts doubt on the effectiveness of statins for the primary prevention of cardiovascular disease. He shared his discomfort with this news and promised to keep a close eye on this issue in the future. I was impressed by his intellectual honesty.

My concerns are that, first, despite the enthusiastic endorsement of the statin drugs by this article, there are probably thousands, if not millions, of patients who are taking statin drugs who will not benefit from them. Some of them, perhaps only a few, will have serious adverse reactions to the medications. And second, that if we are to be true skeptics, we must be skeptical of all views of an issue. To simply say, "Statins: They work, bitches!" is to be condescending and intellectually dishonest to skeptics.

Charles Young, MD
Champaign, Illinois

The article "Statin Denialism" by Dr. Harriet Hall reflects the current understanding about commercial medicine to treat symptoms and ignore cures or understanding about why the situation arises at all. As the individual ages, they do not make as much of the precursor of 150 hormones in the body that are made out of the cholesterol in the blood. There are two models that are suggested here, an inhibition model as offered by Dr. Hall and a flow-through model as suggested by me. The inhibition model slows down the production of cholesterol in the liver by inhibiting the production of cholesterol. The flow-through model is one that provides a public domain drug called "Pregnenolone" that is available over the counter and is relatively cheap. It helps the body convert the cholesterol into the 150 hormones in the body and lowers the cholesterol better than the inhibition model.

Chris Richardson
Gold River, California

Harriet Hall, MD, replies:

Some readers found the language "Statins: They work, bitches!" inflammatory. It was not meant to be condescending or to insult anyone; it was intended to be the same humorous reference to an xkcd *comic that Richard Dawkins used to defend science, as I carefully explained in the endnotes.*

Ms. Behn is understandably concerned because of her mother's unfortunate experience with a rare side effect of statins. But her confidence in Malcolm Kendrick's research is unwarranted. I provided a link (endnote 11) to the Skeptic's Dictionary *article showing how Kendrick and his fellow "Cholesterol Skeptics" use distortions and deceptive techniques in their arguments. One reviewer of Kendrick's book* The Great Cholesterol Con *(http://www.cholesterol-and-health.com/Malcolm-Kendrick-Great-Cholesterol-Con.html) describes it as full of sarcastic humor and says "readers with a background in the relevant science might also laugh at some of the egregious scientific errors in the book and some of Kendrick's poorly conceived speculations."*

Behn's criticism of the Cholesterol Treatment Trialists is also unwarranted. Her claim that they "allow no one to see the data on which their conclusions are based" is demonstrably false. Their process is transparent. They publish periodic meta-analyses of published studies that anyone can read, and they have published a protocol describing the methods they use in their analyses; see https://www.ncbi.nlm.nih.gov/pubmed/?term=ctt+protocol+1995. It is only natural that most of the studies of a pharmaceutical drug will be funded by the manufacturer. That doesn't invalidate a well-done study; it only mandates careful scrutiny.

Mr. McAllen uses the cui bono *fallacy to equate profits to a motive for crime. That doesn't necessarily follow, and he has presented no evidence for "fibs" or "outright fraud" on the part of statin manufacturers. If companies have a valuable product that is used by a lot of people, they can make big bucks from selling it without any need for fibs or frauds.*

I didn't "dismiss" CoQ10. I didn't even mention it, because it is not a part of the published expert treatment guidelines. And I certainly didn't "dismiss side effects as if they don't exist." I devoted an entire three-paragraph sec-

tion of my article to the evidence about side effects. And I provided references.

Dr. Young is confused. My article was about denialists, not about rational skeptics. Science-based doctors are the quintessential skeptics: they ask for evidence, reach provisional conclusions based on the best available evidence, and readily change their conclusions when better evidence comes along. Young provides no evidence, only an anecdote from a lecture he attended several years ago. The lecturer was probably right at the time: a few years ago, there was little evidence to support using statins in primary prevention. Now there is compelling evidence. A good skeptic wouldn't rely on the opinion of a single individual from several years ago; he would consider the consensus of experts who are up-do-date on today's latest research.

Young says thousands of patients are taking statins who will not benefit from them. That's true, as I explained in my article and illustrated with the visual decision aid shown in Figure 1. In fact, most patients don't benefit from most drugs. *We prescribe antibiotics for sinusitis, but they only speed resolution of symptoms for one out of every fifteen patients (http://www.thennt.com/nnt/antibiotics-for-radiologically-diagnosed-sinusitis/). We have to treat 125 patients with blood pressure medications to prevent one death, 100 to prevent one heart attack, sixty-seven to prevent one stroke. We have no way to predict which individuals will benefit, so we are stuck treating many who won't. I like to compare it to insurance. Most people insure their homes against fire, but not many houses burn down.*

Richardson offers an untested "flow through" hypothesis and claims that Pregnenolone lowers cholesterol better than statins. He offers no evidence from clinical studies, because there isn't any. As Christopher Hitchens said, "What can be asserted without evidence can be dismissed without evidence."

Teaching Evolution

Regarding "Helping Teachers Teach Evolution in the United States" (May/June 2017): My years of teaching Biology were at Las Cruces High School in Las Cruces, New Mexico. During many of those years, we had a unique biology program featuring a two-year rotating schedule of one-semester courses. All students were required to take human biology, which was offered every semester. besides it, they could take genetics and the cell (recommended for college bound), human physiology, marine biology, mammology, or others, or another science course. I taught the one-semester course on evolution.

It is possible to study evolution step-by-step, starting with the fact that evolution happens in populations, not individuals. An individual cannot evolve, an exception being hybrid plants that double their chromosomes and thereby become fertile. Next, there is variety in populations. We do not all look the same due to genes and DNA. Then, populations tend to increase in size at exponential rates. Put a pair of fruit flies in a jar and count them over time. . . .

There is selection for genes that are an advantage in the environment. If you have both black chickens and white chickens on a white background, the chicken hawk is going to kill mostly black ones because they are obvious. If the background is black, the hawk will kill mostly white ones.

This selection causes the frequency of genes in populations to change over time. The end. The change in frequency of genes in populations over time is what evolution is. What that has caused is a different matter. Also, such changes have been observed, which makes evolution a fact, not a theory.

One of the biggest problems in teaching evolution is that those who are against it do not know what it is.

Toward the end of the course we brought our Bibles for discussion. Without pounding the desk, I advised them, at their stage in life, to consider the nature of their belief in God. If God functioned in their life as the explanation for what they did not understand, then the more they understood, the less they needed God. They should consider making the nature and need for God more personal.

Roy Vail
Mena, Arkansas

APA's Long Erosion

Douglas M. Stokes writes in the May/June 2017 Skeptical Inquirer ("Chicken Acceleration? APA puts Imprimatur on Credulous Psi Book") that the publication by the American Psychological Association (APA) of a book presenting a positive view of parapsychology represents an "erosion of the APA's scientific standards." Regrettably, that erosion did not begin with the book that Stokes addresses; it has been going on for some time.

Consider these books published by the APA since 1999: *Integrating Spirituality Into Treatment*, 1999; *A Spiritual Strategy for Counseling and Psychotherapy*, Second Edition ("highlights the therapeutic possibilities religion and spirituality can offer"), 2005; *Spiritually Oriented Psychotherapy* ("examining the spiritual dimensions in therapy"), 2005; *Spirituality and the Therapeutic Process*, 2009; *Spiritual Practices in Psychotherapy* ("integrating spiritual and religious tools in therapy"), 2009; *Spiritually Oriented Interventions for Counseling and Psychotherapy* (which addresses "sacred themes in therapy"), 2011; *Spiritual Interventions in Child and Adolescent Psychotherapy* (which addresses "use of prayer," "sacred texts," and "God images in therapy"), 2013; and *APA Handbook of Psychology, Religion, and Spirituality*, Two Volumes, 2013. And these APA videos: *Theistic Integrative Psychology*, *Spiritual Awareness Psychotherapy*, and *Christian Counseling*. The APA also publishes the journal *Spirituality in Clinical Practice*, which "encompasses spiritually oriented psychotherapy." Finally, the APA heralded its publishing in 2014 of *Complementary and Alternative Medicine for Psychologists* ("from ayurveda to yoga [also Herbals, Aromatherapy, Chiropractic, and Reiki]. . . how these treatments actually work . . . making referrals to qualified CAM providers").

I am awaiting the APA's publishing *Exorcism for Psychologists*.

The membership of the Association for Psychological Science (APS), by the way, includes scientifically oriented clinicians. APS publishes the journal *Clinical Psychological Science*, which is edited by Scott O. Lilienfeld, a member of CSI's Executive Council.

Kenneth G. Crosby
(APA retired fellow, APS retired member)
Livingston, Texas

Fairies and Furry Beasts

I was interested to read "The Return of the Fairies" in the SI (May/June 2017) in which Polidoro mentions the Rossendale Fairies (not Rossdale as stated). I was born and brought up in Rossendale. Nothing ever happens there and although I have not lived in Rossendale for many years, I still receive the local paper *The Rossendale Free Press*, mainly to read the obituary columns.

I cannot recall any mention of the fairies at the time (I understand they were photographed in Whittaker Park, where I used to play tennis and once had a brief job as a gardener). However, from time to time the newspaper features a report of the sighting of "The Huttock Top Beast." Huttock Top is a rural area in Rossendale and some say that the mysterious beast is a lynx or a puma. Whenever the newspaper announces a new sighting there is a flurry of further reports of evidence of the creature's presence (a paw print that "can't be anything other than a puma's"; a sheep "so badly savaged it could not have been by a dog or fox," etc.). Interest then dies down until the next sighting.

In the 1980s, there were reported sightings of a lion wandering around but nothing came of it. In fact, big cat sightings have been a common phenomenon for many years in the British Isles and there are a number of groups and websites dedicated to reporting them. There is no convincing evidence that they actually exist (other than a couple of recaptures of escaped animals). Most recently one was caught on camera in Somerset (http://tinyurl.com/lj6hsrp). Some people think it may be two animals walking together.

Michael Heap
www.mheap.com

Nicely Subversive

Just loved "All the Skeptic Ladies" by Celestia Ward in the May/June 2017 SI [Last Laugh page]! I had never heard of her before, but Google was informative. She's brilliant, and nicely vulgar and subversive (I particularly liked her nice, calm "WHY?"). And I've met some of her skeptical friends—Eugenie and

Dr. Harriet. Let's see more of her.
From a mere male,

Ray Ward (a distant relative, no doubt!)
London, England

Statistical Fallacy about Nuclear Risks

Dr. Daniel A. Vogel's essay "Nuclear Power and the Psychology of Evaluating Risk" (November/December 2016 and Letters, March/April 2017) offers a thinking person's version of the statistical argument that total deaths from nuclear power accidents are, as yet, far less than annual deaths from coal-smoke pollution. He claims, "There are risks millions of us take every day that vastly surpass that of operating Chernobyl and Fukushima on their worst days."

But that is precisely the hole in Vogel's argument. We do not yet know what a worst day, a worst scenario, might be for a nuclear power plant. Even the biggest disasters so far have been ones that, in the end, proved just possible to (partially) control and manage. We have not yet seen a true full meltdown. We have not yet seen a nuclear plant in the hands of suicidal terrorists or a psychotic individual. We have not yet seen a war in which missiles target nuclear power stations. In the early days of Fukushima, there was a small but very real chance of an explosion whose wind-blown fallout would make not just Japan but much or most of the Northern hemisphere uninhabitable. Such risks are small—per year. But in time they approach certainties because corners are always being cut, since in the real world nuclear power is run by private companies whose motive is profit, not safety.

Mark O'Connor
Canberra, ACT, Australia

[Mark O'Connor has published a long review of Vogel's argument on his blog at http://markoconnor-australianpoet.blogspot.com/.]

Daniel A. Vogel replies:
I had the pleasure of corresponding with Mr. O'Connor, who argues that my addressing the biases inherent when evaluating the risk of nuclear power failed to account for disasters that may not yet have arisen (e.g., a terrorist attempts to blow up a plant). It is true that I was considering prior accidents and not factoring in worst-case scenarios (although Mr. O'Connor is of course assuming that a rare attack would lead to one, whereas I was arguing that even including two prior worst-case scenarios, the average data on nuclear plants' safety suggests a very good safety record, and thus their being well worth the risk). I was arguing that while many scientists feel nuclear power is the safest source of large-scale electricity, contributing minimally to global warming and being exceptionally clean, it seems possible to me that a bias is at work among nuclear energy opponents who will try to argue against that determination out of hand, as does Mr. O'Connor, looking for all sorts of strange loopholes such as a madman damaging a plant, rather than examining existing economical and environmental costs (storage of waste, high expense, time frame in building one, even a meltdown).

Is Mr. O'Connor's argument part of a rational appraisal of the safety of one form of energy against another, especially when it could be leveled to critique almost anything? For example, crazy people did kidnap two planes and crash them into two skyscrapers, murdering 2,871 people, but would that be a valid argument against the average safety of airplanes or skyscrapers? (An average means that worst-case scenarios are included in estimating safety.) My small brain is fried thinking through all this, since after all we are living in a world with periodic outbreaks of terrorist attacks, however rarely, so I'll leave the readers of Skeptical Inquirer *to decide for themselves and, being curious by nature, I will hope that its editor will allow the juiciest responses further space in a future issue. I also think that ultimately this question is best settled by nuclear scientists, or at least physicists.*

Confusing Liberals and Skeptics?

I'm a full-blooded skeptic (no gods, afterlife, miracles, ghosts, paranormal realm, "energy," quack medicine, or cryptoids). I'm also a straight out conservative: social, fiscal, and cultural as well as a lifelong science enthusiast. I constantly have to point out to Christian friends that I'm tolerant. The rude, militant, obnoxious, condescending intolerance they are used to from liberal atheists comes from the liberalism, not the atheism.

Now here comes Bill Fishman (Letters, May/June 2017) telling me I have mere beliefs. Facts are irrelevant to me, and conservatives act while liberals debate. (I remember when SDS members, not a conservative among them, proclaimed it was "time to stop talking and start killing." Hello, leftists haven't stopped acting since.)

Fishman hopelessly confuses liberals and skeptics, but liberalism and skepticism are incompatible for the same reasons skepticism and intense religious belief are incompatible. To the appalling extent liberals have taken over the skeptical movement they have smothered and prostituted it in exactly the fashion they smother and prostitute every other movement they hijack.

The conservatives I know are mostly decent, intelligent, thoughtful people, many well educated who enjoy serious reading, generally are more responsible, compassionate, and trustworthy than liberals.

Liberalism is a social and psychological substitute for religion for most of its adherents. It embodies most of the pernicious elements of extreme religion and few of its virtues and there are few better examples of its lobotomizing attributes of superiority, importance, and entitlement than Fishman's letter.

Here is the defining question where liberals and conservatives disagree. I call it a fact and you can call it anything you want: you and your friends do not have the knowledge, intelligence, wisdom, virtue, or incentives to justify controlling my life to the overweening and debilitating extent you desire.

Norman Carlson
Busti, New York

And That's No Bull

The articles on the Library of Congress ("Library Catalogs Deny Science Denial" and "Information Bias in Library Catalogs," May/June 2017) by Sanford Berman and Timothy Binga were fine introductions to problems in cataloging. However, I submit that the Library of Congress deserves our admiration, having chosen "BS" as the call sign for "The Bible" in their classification system.

Jerome Shedd
Ripton, Vermont

Why Respect Fantasies?

I've read the letter from Sharon Sheffield and Benjamin Radford's reply to it ("Odysseys in Skepticism," Letters, March/April 2017) regarding Radford's earlier article, "Skepticism's Big Tent." There are billions upon billions of faith-believers among us. Faith is a firm belief in the truth of something based on hope and conjecture. There is zero proof that a transcendental personal god exists, or that any god exists, or that that god, the one given credit for creating carnivores who must inflict excruciating pain and suffering on innocent herbivores for food, is kind, just, or all-loving. I find the belief that an angel named Gabriel came down to Earth and dictated the contents of the Qur'an to an illiterate desert dweller over a twenty-three-year period to be preposterous.

Carl Sagan rightly observed that "the physical laws of the universe apply equally to everyone." The notion that Jesus died on the cross and was dead for three days before rising and going to Galilee is equally preposterous. The brain, deprived of oxygen for ten minutes, is dead. Within an hour of death, rigor mortis begins setting in. Frankly, I find it virtually impossible to accord any degree of respect or dignity to those fantasies, to say nothing about the notion that the Earth was created by their god in six days. Those folks simply don't know what they don't know. I should respect that?

Richard Sutherland
Winter Haven, Florida

From the Editors

Benjamin Radford's review of Robert Sheaffer's book *Bad UFOs* (July/August 2017) noted that the book contained random words in boldface. Sheaffer notes in his introduction (which was not included in the preview copy sent for review) that the boldfaced terms denote Internet search terms in place of conventional footnotes or URLs.

The letters column is a forum on matters raised in previous issues. **Letters should be no longer than 225 words**. Due to the volume of letters we receive, not all can be published. Send letters as email text (not attachments) to letters@csicop.org. In the subject line, provide your surname and informative identification, e.g.: "Smith Letter on Jones evolution article." Include your name and address at the end of the letter. You may also mail your letter to the editor to 944 Deer Dr. NE, Albuquerque, NM 87122.

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San Diego Association for Rational Inquiry (SDARI) President: Tom Pickett. Email: pickett.thomasj@gmail.com. Program/general information 619-421-5844. www.sdari.org. Postal address: PO Box 623, La Jolla, CA 92038-0623

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The organizations listed above have aims similar to those of the Committee for Skeptical Inquiry but are independent and autonomous. Representatives of these organizations cannot speak on behalf of CSI. Please send updates to Barry Karr, P.O. Box 703, Amherst NY 14226-0703.
International affiliated organizations listed at www.csicop.org.

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